1. GENERAL CHARACTERISTICS

1.1. – INTRODUCTION

The tape handler provides tape drive, general tape movement control during Read/Write operations, and oversees to forward status signals to the Controller (MTC).

It is completely slaved to that controller from which it receives signals and is capable of operating On-Line with the 100 line processing systems using both 7 and 9 track tapes with the following characteristics:

TRACKS	RECORDING	
	DENSITY bpi	MODE
9	1600	PM ■
* 9	800	NRZI ●
* 7	200/556/800	NRZI

* = Optional ■ Phase Modulation ● Non Return to Zero Indiscrete

There are two basic versions of this handler, one having a 220 V/50 Hz supply and the other a 208 V/60 Hz mains supply.

1.2. – GENERAL

1.2.1. – Physical Configuration

The handler is composed of the following elementary units:

UNIT	DESCRIPTION
MUN 140	Mechanics
MUN 141	Standard reel hub and write inhibit group
MUN 143/4	Reel and capstan motors
MUN 043/062	Magnetic head assemblies
GUN 150	DOE and DEM
GUN 162/5/8	GUN 150 Adjuncts
ALI 040	Power Supply
TAV 240	Operators Control Panel
CON 270	Cabinet
CON 271	Fan group and accessories

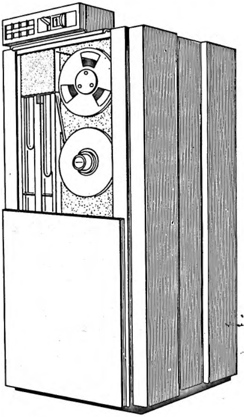


Fig. 1.1. – General View

1.2.1.1 - MUN 140 : Mechanics

Tape drive is essentially accomplished with a single rubber covered capstan, keyed to a low inertia rotor shaft, whose rotation direction is controlled through a logic command.
Tape movement is obtained through the two vacuum bins, located on either side of the capstan, that by vertically drawing more tape in the columns, cause it to be tightly wrapped over 180° of the rotating capstan surface.
The tape is wound on two servomotor driven reels, one a fixed "machine reel" and the other a moveable "file reel" so as to permit tape reel swapping.

1.2.1.2 - MUN 141 : Standard Reel Hub and Write Inhibit Group

The MUN 141 comprises a Std. reel hub with a file reel locking device and also incorporates a "FILE PROTECT" write inhibit group.

1.2.1.3 - MUN 143/4 : Reel and Capstan Motors

The capstan driver is a low inertia DC motor whose speed is controlled by an optical tachometer.
The reel drive motors are DC series motors with two windings, one for the clockwise (CW) and the other for the counter-clockwise (CCW) rotation.

TYPE	DESCRIPTION
MUN 143	18.75 and 37.5"/sec Reel and Capstan Motors
MUN 144	75"/sec Reel and Capstan Motors

1.2.1.4 - MUN 043/062 : Magnetic Head Assemblies

These Read Write 9 track heads are fitted with a pre-erase section.

TYPE	DESCRIPTION
MUN 043	9 track - 800/1600 bpi - 18.75"/sec Heads
MUN 062	9 track - 800/1600 bpi - 37.5 and 75"/sec Heads

The read to write head gap is 0.15". Two cleaners are fitted on the heads to eliminate oxide and dust particles that may deposit on the tape.

1.2.1.5 - GUN 150 : DOE and DEM

The GUN 150, comprising the Device Oriented Electronics (DOE) and the Data Electronics Module (DEM), is that section which performs all the logic and operative functions regarding:

- Data transfer from and onto tape
- Fulfillment of controller and operator panel commands
- Reel and capstan motor control
- Beginning of tape (BOT) and end of tape (EOT) reflective strip sensing
- Forwarding of machine statuses to the controller

The GUN 150 chassis swings outwards so as to permit maximum servicing access.

1.2.1.6 - GUN 162/5/8 : GUN 150 Adjuncts

These adjuncts are made up of PWB kits, selected depending upon handler speed, number of head tracks and recording system being used.

TYPE	DESCRIPTION
GUN 162	9 track - PM - 18.75"/sec GUN 150 Adjuncts
GUN 165	9 track - PM - 37.5"/sec GUN 150 Adjuncts
GUN 168	9 track - PM - 75"/sec GUN 150 Adjuncts

1.2.1.7 - ALI 040 : Power Supply

The ALI 040 is the handlers local DC Power Supply that drives:

- The DOE and DEM assemblies
- Reel and capstan motors
- Auxiliary services.

The Power Supply also comprises the reel and capstan motor power circuits and has its own ventilation system.

1.2.1.8 - TAV 240 : Operator's Control Panel

This is the handlers operator control panel that houses all pushbuttons and switches necessary for manual operations, light indicators and handler select dial.

1.2.1.9 - CON 270 : Cabinet

The handler cabinet is wheel mounted for easy movement and has two adjustable feet to set it to plumb. It is provided both with a front and rear door, the front one having a sliding window so as to gain access to the reels and bins during load operations.

1.2.1.10 - CON 271 : Fan Group and Accessories

The CON 271 is the GUN 150 supporting structure, comprising a swing-out fan module.

1.3. - PERFORMANCE

1.3.1. - Recording Mode

The type of recording used is Phase Modulation (PM) on 9 tracks.
An optional method with Non Return to Zero (NRZI) on 7 or 9 tracks may also be used.

Tape Speeds

	RATED SPEED "/sec	REWIND SPEED "/sec
MTH 163	18.75	≃ 300
MTH 166	37.5	≃ 300
MTH 172	75	≃ 300

Density

7 TRACK HANDLERS	9 TRACK HANDLERS
200 bpi (NRZI)	
556 bpi (NRZI)	
800 bpi (NRZI)	800 bpi (NRZI)
	1600 bpi (NRZI)

Data Transfer Frequency

WRITE DENSITY	MTH 163	MTH 166	MTH 172
200 bpi	3,750 chrt/sec	7,500 chrt/sec	15,000 chrt/sec
556 bpi	10,425 chrt/sec	20,850 chrt/sec	41,700 chrt/sec
800 bpi	15,000 chrt/sec	30,000 chrt/sec	60,000 chrt/sec
1600 bpi	30,000 chrt/sec	60,000 chrt/sec	120,000 chrt/sec

1.3.2. - Functions

The handler can perform the following operations:

- Read, both in forward and reverse
- Write
- Erase
- Set write density
- Set either parity or disparity
- Rewind tape, with possibility of an Operator Call signal for reel change
- Position BOT reflective strip under sensor during load operations.

1.3.3. - Built-In Checks

The checking features provided on the handler are:

- Phase fall on AC mains
- DC voltage and current
- Power circuit and transformer temperatures.

1.3.4. - Start/Stop Characteristics

Start Time

Defined as the time within which the tape, from the moment the START command has been issued, must fall within the prescribed ± 5% speed tolerances. Maximum times for the different handlers are:

MTH 163	MTH 166	MTH 172
3.5 ms	5 ms	-

Stop Time

Is the time within which, from the instant the STOP command has been issued, the tape actually comes to a dead stop on the heads. Maximum times are :

MTH 163	MTH 166	MTH 172
2.5 ms	4 ms	-

Start Lag

Defined as the distance of tape travel that occurs during the Start Time.

MTH 163	0.030 to 0.040"
MTH 166	0.090 to 0.110"
MTH 172	-

Stop Lag

Tape travel distance during Stop time.

MTH 163	0.020 to 0.032"
MTH 166	0.070 to 0.098"
MTH 172	-

1.3.5. - Read/Write Parameters

Jitter

It is the maximum percentual variation range of recording distance between two successive bits written on the same track.

MTH 163	MTH 166	MTH 172
± 3%	± 1.8%	-

Dynamic Skew

Defined as the maximum time lapse between the reading of two successive bits forming the same character, during normal forward (FWD) and reverse (REV) modes.

MTH 163	MTH 166	MTH 172
10 us	5 us	-

1.3.6. - Compatibility

The tape format is compatible with those of the main standard systems:

- 729, 7330, 2400 : 7 Track NRZI series
- 2400 : 9 Track PM, NRZI series
- ASA : 7/9 Track NRZI series.

1.3.7. - Tape Formats

Inter-record Gaps

The inter-record (sometimes referred to as interblock) gaps must result:

- 0.75" long : for 7 track tapes
- 0.6" long : for 9 track tapes.

BOT and EOT Markers

The tape must be fitted with two reflective strips, to signal Beginning of Tape (BOT) and End of Tape (EOT), as shown in Fig. 1.2.

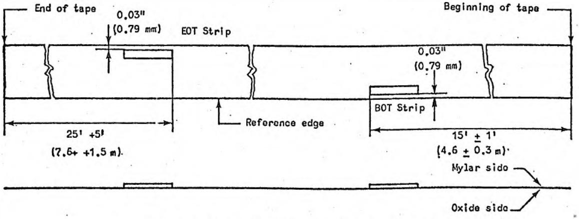
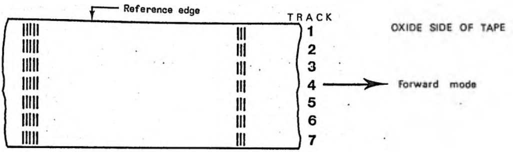


Fig. 1.2. - BOT and EOT Strips

Track Arrangement and Numbering

Tracks are consecutively numbered starting with the first track from the reference edge as shown in Fig. 1.3.



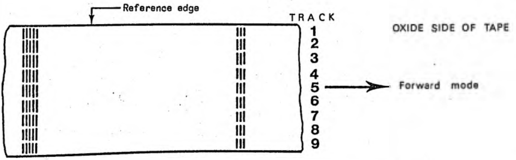


Fig. 1.3. - Track Numbering

Bit to Track Relationship

The relationship between the bits of a character and track is the following:

Track n°	1	2	3	4	5	6	7
Bit	2^0	2^1	2^2	2^3	2^4	2^5	P

7 track tapes

Track n°	1	2	3	4	5	6	7	8	9
Bit	2^2	2^0	2^4	P	2^5	2^6	2^7	2^1	2^3

9 track tapes

The positional bit values, $2^0 - 2^1 - 2^2$ etc., to the right of the bit itself, represent its binary power, while track P indicates the longitudinal check bit associated to each character.
Fig. 1.4. gives the track to T2 interface bit relationship.

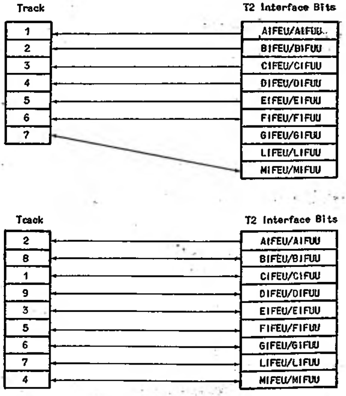


Fig. 1.4. Track/Interface Bit Relationship for 7/9 Track Tapes

1.4. - PHYSICAL CHARACTERISTICS

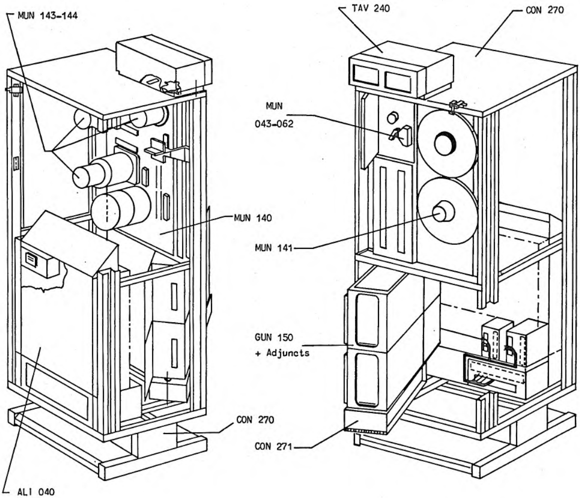
The magnetic tape handler is housed in a single free standing cabinet, as shown in Fig. 1.1., having the following dimensions:

WEIGHT	257 Kg	565.4 lb
HEIGHT	1.820 mm	72"
LENGTH	720 mm	28.3"
WIDTH	700 mm	27.5"

During tape loading and unloading operations, the operator may gain access to the transport assembly by pulling down the sliding window incorporated in the front unit door.

1.5. - MECHANICAL CONFIGURATION

The mechanical configuration is given in Fig. 1.5. which shows all the elementary units that make up the subsystem itself.



REAR VIEW

FRONT VIEW

Fig. 1.5. - Mechanical Configuration

1.6. - ELECTRICAL DESIGN

The handlers electrical and logical connections, both within its elementary units to controller and other tape units making up the subsystem configuration, are all realized by means of cables.

1.6.1. - Interconnections

Fig. 1.6., shows an interconnection schematic between the various elementary units of the handler.

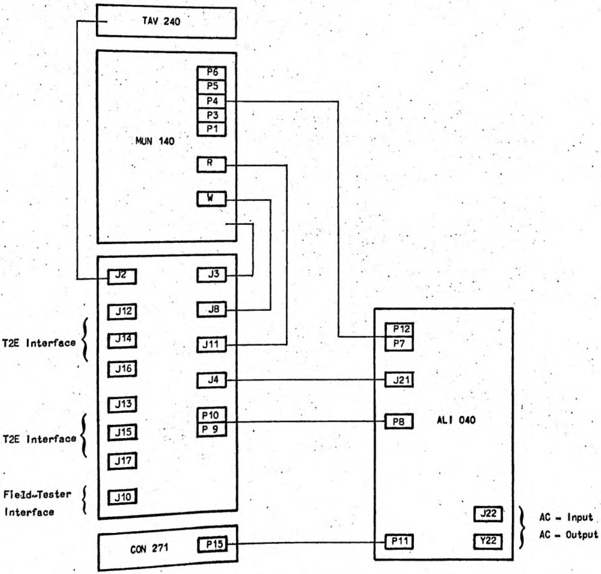


Fig. 1.6. - Interconnections Within the Handler

1.6.2. - Subsystem Interconnections

Handler/controller link-up is accomplished with 4 daisy chain connected cables as shown in Fig. 1.7..

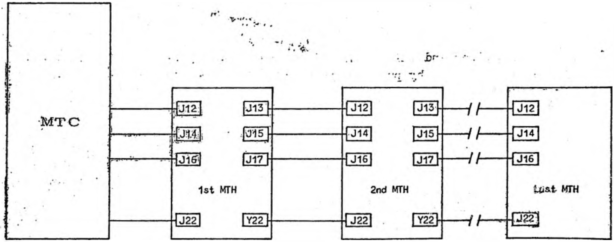


Fig. 1.7. - Subsystem Interconnections

1.6.3. – Interface to MTC

This is the T2E interface, physically present on the various connectors. Interface signals refer to logic levels "1" and "0". Logic "1" if the function, that gave rise to the signal, has been executed and logic "0" if it has not.
Except for particular cases, these logic levels correspond to the following voltages, the values of which also prevail with pulsed signals:

- Logic "1" = 0 V
- Logic "0" = +6 V.

Table 1.1. summerizes the T2E interface.

FUNCTION	MEANING	MTC	MTH	LOGIC NAMES	WIRES
Selection Command Information	Distributor channel		→	AIFUU to MIFUU	9
Selection	Selection Strobe		→	TEUNU	1
Commands	Command Strobe		→	TECOU	1
Write	Enable Write		→	REGIU	1
	Write Strobe		→	TEREU	1
	Write Reset		→	REREU	1
Read	Read Channel	←		AIFEU to AIFE9 MIFEU to MIFE9	9 x 2
Drive	RUN/STOP		→	VIANU	1
	FWD/REV		→	AVANU	1
Statuses	Out of Service	←		MAREU	1
	Available	←		MAPEU	1
	BOT	←		BOTAU	1
	EOT	←		TESEU	1
	Inhibit Write	←		INREU	1
	7/9 Tracks	←		NOVIU	1
	Parity/Disparity	←		PARIU	1
	Density	←		IMO1U, 2U	2
	Selection NOR	←		NOSEU	1
	NRZI	←		NORIU	1
Reset	General Reset		→	REGEU	1

Table 1.1. – T2E Interface

1.6.4. - Interface to Field Tester

Physically present on the J10 connector, this interface in summarized in table 1.2.

FUNCTION	MEANING	F.T.	MTH	LOGIC NAMES	WIRES
Information	Distributor Channel		→	AITUU to MITUU	9
Commands	Rewind		→	RIATU	1
	Rewind and Unload		→	SCATU	1
Write	Enable Write		→	REFIU	1
	Write Strobe		→	TERET	1
	Write Reset		→	RETIU	1
Read	Read Channel	←		APAT to MITA	9
Drive	Run/Stop		→	GOFIU	1
	Fwd/Rev		→	AVATU	1
Enable	Chan.Sel. on PWBs PARI		→	INDO	1
	FM Amplifier Selection		→	MIFI	1
	FM Density	←		MISE	1
	Off Line Unit	←		NUOO	1
Check	Tachometer Signal	←		TAMA1	1

Table 1.2. - Interface to Field Tester

1.6.5. - DOE to DEM Interface

The DOE/DEM connection is accomplished through wire-wrap wiring. Table 1.3. summerizes this interface.

FUNCTION	MEANING	DOE	DEM	LOGIC NAMES	WIRES
Commands	Fwd Drive	←		01AV	1
	Rev Drive	←		01IN	1
	Rewind	←		RIVAN	1
Selection	Unit Name		→	NU1ON	1
			→	NU2ON	1
			→	NU3ON	1
Signals	Stand By		→	PEUN	1
	Out of Service		→	MARE1	1
	Inhibit Write		→	INIR2	1
	BOT		→	FOIN1	1
	EOT		→	FOFIN	1
	Loading		→	LOSE	1
	Operator Call	←		CIOPN	1
	Operator Call	←		CIOPU	1
	Rewind	←		RIAVD	1
Reset	General Reset	←		REBUN	1
	Off Line		→	NUOOA	1
Power	Delayed +20		→	+20 R	1

Table 1.3. - DOE to DEM Interface

1.7. - POWER SUPPLY

1.7.1. - AC Power

The handler is driven by a 3 phase AC power without neutral, with a daisy chain connection between the various units.
The phase, present on the output connector of every unit, is rotated so as to obtain a rough balancing to the subsystems input.

THREE-PHASE SUPPLY	220 V 50 Hz 208 V 60 Hz		
Load current	I1	I2	I3
Stand By	3,3 A	2,2 A	2 A
Max.	4,4 A	3,2 A	3,2 A

Load current is referred to the 220 V - 50 Hz power supply.

1.7.2. - DC Power

The DC power is supplied by the handlers local ALI 040 Power Supply that gives the following voltages:

VOLTAGE	MAX. LOAD CURRENT	USED TO SUPPLY
+48 ± 4.8 Volts	6 A	Reel Motors
+20 ± 0.4 Volts	6 A	GUN 150
-20 ± 0.4 Volts	1 A	
+20 ± 0.4 Volts	10 A	Capstan Motors
-23 ± 2.3 Volts	10 A	
-24 ± 2.4 Volts	2.5 A	Brakes, "OFF" Lamps and fluorescent lamp.

The +20 R delayed voltage (≃ 3 sec) is derived from the +20 supply. This delayed voltage is used by the circuits that furnish the interface signals and the general reset drive circuit.

1.8. – OPTIONS

The handler can process 9 track tapes in PM mode or optionally 7/9 track tapes in NRZI mode.

1.8.1. – NRZI

This option is made up of the GUN 150 adjuncts, the choice of which depends upon machine speed, recording system and the number of head tracks.

TYPE	DESCRIPTION			
GUN 161	7 track	NRZI	18.75"/sec	GUN 150 Adjunct
GUN 163	9 track	PM + NRZI	18.75"/sec	GUN 150 Adjunct
GUN 164	7 track	NRZI	37.5"/sec	GUN 150 Adjunct
GUN 166	9 track	PM + NRZI	37.5"/sec	GUN 150 Adjunct
GUN 167	7 track	NRZI	75"/sec	GUN 150 Adjunct
GUN 169	9 track	PM + NRZI	75"/sec	GUN 150 Adjunct

1.8.2. – 7 Track NRZI Head Assemblies

Seven track NRZI handlers may be fitted with the following heads:

TYPE	DESCRIPTION			
MUN 053	7 track	800 bpi	18.75"/sec	Head
MUN 022	7 track	800 bpi	37.5 and 75"/sec	Head

The read to write head gap is 0.3". The heads have been fitted with two cleaners so as to keep the tape free from oxide and dust particles.

1.9. - ENVIRONMENTAL REQUIREMENTS

1.9.1. - Operative

The subsystem must operate within the below specified environmental conditions:

Temperature

Limits	°C	+18 to +32
	°F	+65 to +89
Max. Rate of Change	°C/Hr	6.5
	°F/Hr	11

Relative Humidity

Range	%	40 to 60
Max. Rate of Change	%/Hr	5

Atmospheric pressure

mm Hg	585

Vibrations

Max. Floor Vibrations	0.15 g at 10 to 50 Hz

1.9.2. - Shipping and Storage

Temperature

Limits	°C	-29 to +74
(packed handler)	°F	-20 to +165

Relative Humidity

Range	%	5 to 95

There must be no traces of water condensation on the equipment.

Shock

max. g	at < 11 ms

Vibrations

max. g	at 5 to 55 Hz and <4 Hr

2. COMMANDS

The commands that the handler receives from the controller are:

- Selection commands
- Executive commands.

The commands are issued to the interface of all the units within the subsystem but will only be executed by the actual addressed handler.
Commands fall into two categories:

- Coded commands
- Direct commands.

2.1. - SELECTION COMMANDS

The selection code is issued to the distributor channel under binary form, bits AIFUU, BIFUU and CIFUU, clocked by selection strobe TEUNU.
The addressed handler will in turn store the selection.
Table 2.1. lists the codified selections.

MTH N°	AIFUU	BIFUU	CIFUU
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1
8	0	0	0

Table 2.1. - Coded Selections

2.2. - EXECUTIVE COMMANDS

2.2.1. - Coded

These are the coded controller commands that, clocked by command strobe TECOU, are sent to the distributor channel.
The command codes are given in Table 2.2.

	REW.	REW. AND UNLOAD	HIGH DENSITY	MEDIUM DENSITY	LOW DENSITY	PM	PARITY	DISPARITY
AIFUU	1	0	0	0	0	0	0	0
BIFUU	0	1	0	0	0	0	0	0
CIFUU	0	0	1	1	0	0	0	0
DIFUU	0	0	1	0	1	0	0	0
EIFUU	0	0	0	0	0	0	1	0
FIFUU	0	0	0	0	0	0	0	1
GIFUU	0	0	0	0	0	0	0	0
LIFUU	0	0	0	0	0	1	0	0

Table 2.2. - Executive Command Codes

2.2.1.1 - Rewind

This command causes the tape to be rewound until the BOT marker is reached. The command is held and will remain stored even if the handler is no longer addressed.
During the operation, the handler issues a "DEVICE BUSY" signal to the controller.

2.2.1.2 - Rewind and Unload

This command, after the BOT marker has been sensed, sets the handler to the "ON" state. The command is stored and the UNLOAD pushbutton, on the operator panel, will light.
During the operation, the controller receives a "DEVICE BUSY" and an "OUT OF SERVICE" signal from the handler.

2.2.1.3 - Set Density

This command is issued in order to store the selected density at which data is to be written or read on tape.
The addressed handler will in turn signal out this density to the controller.

2.2.1.4 - Set Parity/Disparity Check

This command stores the selected longitudinal parity or disparity check to be used during reading or recording operations. The addressed handler will in turn signal out the selected check to the controller.

2.2.2. - Direct

These are handler commands that are directly issued by the controller through the pertinent interface wires.

2.2.2.1 - Read Forward

This command enables a character block of any length, encountered during forward direction, to be read after the controller has triggered the FWD Mode (AVANU = 1) and Drive (VIANU = 1) signals.
Tape movement will cease when the controller disables the drive signal (VIANU = 0).

2.2.2.2 - Read Reverse

This command enables a character block of any length, encountered during reverse direction, to be read after the controller has triggered the REV Mode (AVANU = 0) and Drive (VIANU = 1) signals.
Tape movement will stop when the drive signal is disabled (VIANU = 0).

2.2.2.3 - Write

By issuing this command, data is recorded on the media in the following manner.
The controller enables the FWD Mode (AVANU = 1), Drive (VIANU = 1) and Enable Write (REGIU = 1) signals. This last signal will be stored.
The data to be recorded, clocked by write strobe TEREU, is sent to the distributor channel (AIFUU to MIFUU).
After the last character has been written, the controller issues a Write Reset signal (REREU) that causes the write circuits to reset.
Tape movement will cease when the drive signal is disabled (VIANU = 0).

2.2.2.4 – Erase

When an erase command is executed, a tape erasure of roughly 2" in length is requested.
The controller enables the FWD Mode (AVANU = 1), Drive (VIANU = 1) and Enable Write (REGIU = 1) signals.
Again, tape movement ceases when the controller sets drive signal VIANU to zero.

2.3. – STATUS SIGNALS

The controller will receive the following status signals from the addressed handler. See Table 2.3..

SIGNAL	MEANING	VOLTAGE LEVEL
MAPEU	Unit Available	+6 V – if available
MAREU	Unit Out of Service	+6 V – if out of service
BOTAU	Beginning of Tape – BOT	0 V – if BOT
TESEU	End of Tape – EOT	0 V – if EOT
INREU	Inhibit Write	0 V – if write is inhibited
NOVIU	7/9 Tracks	0 V – if 9 tracks
PARIU	Parity/Disparity	0 V – if parity
IMO1U IMO2U	Density	0 V – if high or medium density +6 V – if low or PM density
		0 V – if high or low density +6 V – if PM or medium density
NORIU	NRZI Option	0 V – if NRZI option is used
NOSEU	Selection NOR	Not Standard *

* +14,8 V – if no selection

* +8 V – if only 1 selection

* +5,5 V – if 2 selections

Table 2.3. – Status Signals

3. OPERATING AND MAINTENANCE INSTRUCTIONS

3.1. - OPERATOR CONTROL PANEL

The handler is equipped with an operator control panel which encorporates all the pushbuttons and switches necessary for manual operations, light indicators and a handler address select switch.
The panel is illustrated in Fig. 3.1..

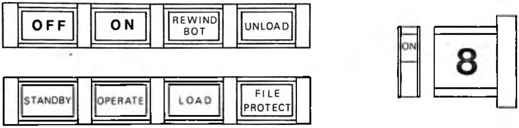


Fig. 3.1. - MTH 163-166-172 Operator Panel

3.1.1. - Functional Description of Pushbuttons and Indicators

PUSHBUTTON			INDICATOR	
NAME	TYPE	FUNCTIONAL DESCRIPTION	MEANING	COLOUR
OFF	Monostable	De-energizing the TL1 breaker, on the Power Supply, cuts off power to all handler devices. The mains only supply transformer T2, so the -24 V and ALER1 service voltages will be on, as they derive from the secondary of T2. This pushbutton also turns off the ON indicator.	The lower half indicates that the handler is connected to the mains. The +24 V voltage is therefore present.	Yellow
		Power may also be cut off through the thermal transformer or heat sink thermosws. In this case TL1 is de-energized through the action of RL3 that opens the TL1 hold-on circuit.	The upper half lights when either the heat sinks or transformers overheat, and goes out only when this malfunction ceases.	Red
ON	Monostable	Supplies power to all handler devices by energizing main breaker TL1. Turns off the OFF indicator.	All the power supply voltages are on. The handler is set for loading.	Yellow
STAND-BY	Monostable	Stops any tape drive condition. Switches the handler from OPERATE to STAND-BY. "Anded" to the OFF position of the ON-OFF LINE switch, enables the handler to be commanded from the Field Tester.	The handler could either be in an inoperative or in one of the tape drive conditions (through Field Tester command); or in Rewind (through console command).	Blue

3. OPERATING AND MAINTENANCE INSTRUCTIONS

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The handler is equipped with an operator control panel which encorporates all the pushbuttons and switches necessary for manual operations, light indicators and a handler address select switch.
The panel is illustrated in Fig. 3.1..

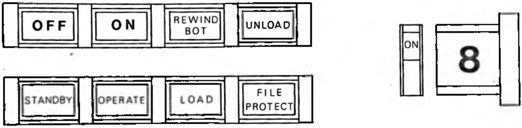

Fig. 3.1. - MTH 163-166-172 Operator Panel

3.1.1. - Functional Description of Pushbuttons and Indicators

PUSHBUTTON			INDICATOR	
NAME	TYPE	FUNCTIONAL DESCRIPTION	MEANING	COLOUR
OFF	Monostable	De-energizing the TL1 breaker, on the Power Supply, cuts off power to all handler devices. The mains only supply transformer T2,so the -24 V and ALER1 service voltages will be on, as they derive from the secondary of T2. This pushbutton also turns off the ON indicator.	The lower half indicates that the handler is connected to the mains. The +24 V voltage is therefore present.	Yellow
		Power may also be cut off through the thermal transformer or heat sink thermosws. In this case TL1 is de-energized through the action of RL3 that opens the TL1 hold-on circuit.	The upper half lights when either the heat sinks or transformers overheat, and goes out only when this malfunction ceases.	Red
ON	Monostable	Supplies power to all handler devices by energizing main breaker TL1. Turns off the OFF indicator.	All the power supply voltages are on. The handler is set for loading.	Yellow
STAND-BY	Monostable	Stops any tape drive condition. Switches the handler from OPERATE to STAND-BY. "Anded" to the OFF position of the ON-OFF LINE switch, enables the handler to be commanded from the Field Tester.	The handler could either be in an inoperative or in one of the tape drive conditions (through Field Tester command); or in Rewind (through console command).	Blue

PUSHBUTTON			INDICATOR	
NAME	TYPE	FUNCTIONAL DESCRIPTION	MEANING	COLOUR
LOAD	Monostable	Vacuum and reel motor power is turned on. Tape loading is accomplished with the handler in FWD mode, until the BOT marker has been reached. This pushbutton also lights STAND-BY and upon the BOT strip sensing, if the ON-OFF LINE switch is in position ON, sets the handler in OPERATE.	No light indicator has been installed as the LOAD condition is a transistory status.	-
OPERATE	Monostable	If the ON-OFF LINE switch is in position ON and interlock SO is closed, the handler will be set under external automatic control. Turns out indicator STAND-BY.	The handler is under external control and therefore not manually operable through Field Tester commands.	Green
REWIND	Monostable	Causes reverse tape drive at 300"/sec only if the handler is in STAND-BY and the BOT indicator is out.	No light indicator installed for this condition.	
BOT	Monostable	No function, it is incorporated in pushbutton REWIND.	The lower part of this pushbutton lights to indicate that the BOT marker is under the photosensor.	White
FILE PROTECT	-	No function.	Indicates a write inhibited condition due to the absence of the plastic Write - Permit ring on the lower tape reel. This condition will only be signalled if the handler is in STAND-BY or OPERATE.	White
UNLOAD	-	No function.	Indicates that the MTC or Field Tester has issued the MTH with a Rewind/Unload com.	White

3.1.2. - ON-OFF Line Switch

This two position switch either places the handler in the ON or OFF-LINE mode.
If the handler is in OPERATE and the ON-OFF LINE switch in position ON,it is predisposed for MTC connections. If on the other hand it is in the STAND-BY status and the ON-OFF LINE switch is in OFF, the handler is ready for Field Tester connection.

3.1.3. - Handler Selection Switch

By setting this dial, the handler will be assigned with a number which will have to the recalled whenever the handler is to be addressed.
A mechanical interlock will hold ~~the~~ selected number when the handler is connected ON-LINE.

3.2. - ROUTINE OPERATIONS

3.2.1. - Tape Loading Sequence

1) - Switch handler power ON.
2) - Open the upper bin cover.
3) - Lift the anti cross-talk shield.
4) - Lift the packer arm.
5) - Mount the file reel on the lower hub, rotating the locking knob CW until the click lock.
6) - Slacken as much tape as needed to thread the media as illustrated in Fig. 3.2.
7) - Wind at least 5 or 6 turns of tape onto the upper reel (machine reel).
8) - Close the upper bin cover.
9) - Correctly position the packer arm, lowering it onto the tape.
10) - Depress LOAD and, as tape will be drawn into the vacuum columns, wait till the FWD drive brings the BOT marker under the sensor and movement is halted. BOT indicator lights.
11) - Set the ON-OFF LINE switch to OFF.
12) - Turn the handler select dial to desired setting.
13) - Set the ON-OFF LINE switch to ON.
14) - Depress OPERATE.

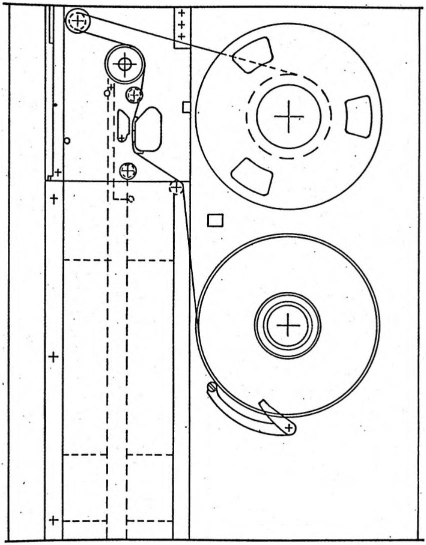

Fig. 3.2. - Tape Threading Path

3.2.2. - Tape Unloading Sequence

The unloading sequences vary depending upon which status the handler is found to be at that particular moment.

a - Handler is STAND-BY

1) - Depress REWIND.
2) - Wait until tape stops on the BOT marker.
3) - Open the upper bin cover and await for brake release.
4) - Wind up all slack tape, from the vacuum columns ect., by manually turning the file reel CCW.
5) - Lift the packer arm.
6) - Turn the file reel hub looking knob CCW to free the reel and hence extract it.

b - Handler in STAND-BY - Connected to Field Tester

1) - Depress Field Tester REWIND-UNLOAD pushbutton.
2) - Wait until tape movement stops and the handler sets to the blocked ON status.
3) - Open the upper bin cover and release the reel brakes.
4) - Wind up all slack tape by turning the file reel CCW.
5) - Lift the packer arm.
6) - Turn the file reel hub locking knob CCW and extract the reel.

c - Handler in OPERATE - Connected ON-LINE to MTC

The REWIND-UNLOAD command is issued by the MTC.
The sequential manual operations are the same as those described in b), above, from step 2 to 6.

3.2.3. - Operation with Upper Bin Cover Open

To enable the handler to function with the upper bin cover open, a condition that is necessary when a tape movement check is to be made, proceed as follows:

1) - Follow through the tape loading sequence according to para. 3.2.1.
2) - Open the upper bin cover.
3) - Pull out the bin cover interlock plunger.

4) - Depress LOAD.

5) - If the handler is connected to the Field Tester, implement the required function with the Field Tester controls.

6) - If the handler is to be connected ON-LINE, set the selection dial to the required address, the ON-OFF LINE switch to ON and depress OPERATE.

> Note
>
> Tape loading operations can only be accomplished with the upper bin cover open when sufficient tape loops are already present in the vacuum columns, as is the case in the above specified procedure.

3.3. - EMERGENCY CONDITION

The handler is fitted with a protective circuit that acts whenever an overheat condition occurs on power supply transformers and power circuit heat sinks.
If such a malfunction should occur, the circuit switches the handler OFF and the upper half of operator control panel pushbutton OFF will light red.
Only when the components return to normal temperature conditions (red light goes out) will it be possible to have the handler ON again.

3.4. - EMERGENCY ROUTINE

To rapidly switch off all subsystem power, in case of an emergency, depress the red EMER-OFF pushbutton located on the CPU control panel.

3.5. - MEDIA HANDLING

To obtain reliable transfer of data, constantly apply and adhere to the below specified tape handling conditions.

3.5.1. - Required Handling Conditions

- Tape must be stored in the climatic conditions specified in para. 1.9.1.
- Before use all new tapes, or those reels that remain unused for a long period of time, should be unfurled and rewound for their entire length.
- Avoid touching tape showing through the reel flange windows.
- Endevour, as much as possible, not to finger the tape.

- Do not leave unutilized reels mounted on the handler.
- Avoid deforming reel flanges or imparting excessive stress on the tape during loading operations.
- Do not smoke when loading the tape.
- Always replace reels in their containers after usage.
- Store file reel containers perpendicularly to avoid the tape from unfurling.

3.6. - VAR 600 FIELD TESTER

3.6.1. - Description

The VAR 600 is a field maintenance set that enables to carry out the following tests:

- Read signal level adjustments and magnetic head static skew alignment
- Start/Stop time checks
- Capstan speed check.

This test set, see Fig. 3.3., is housed in a container having the following dimensions: 247 x 223 x 195 mm and weighs, connection cable excluded, 5.8 Kg (13 lb).
It is also provided with a carrying handle and has a control panel as illustrated in Fig. 3.4.
A connector, mounted on one side, enables the set to be connected to the handler with the included cable.
Load current is in the order of 500 mA. The sets connection cable length is 2 m (6.5 ft).
From a functional point of view, the set is divided in four sections:

- Handler drive control
- Write control
- Read control
- Capstan speed control.

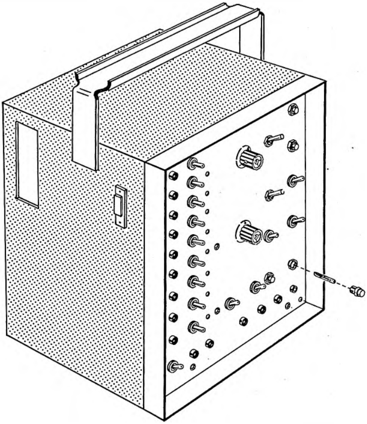

Fig. 3.3. - VAR 600 Field Tester

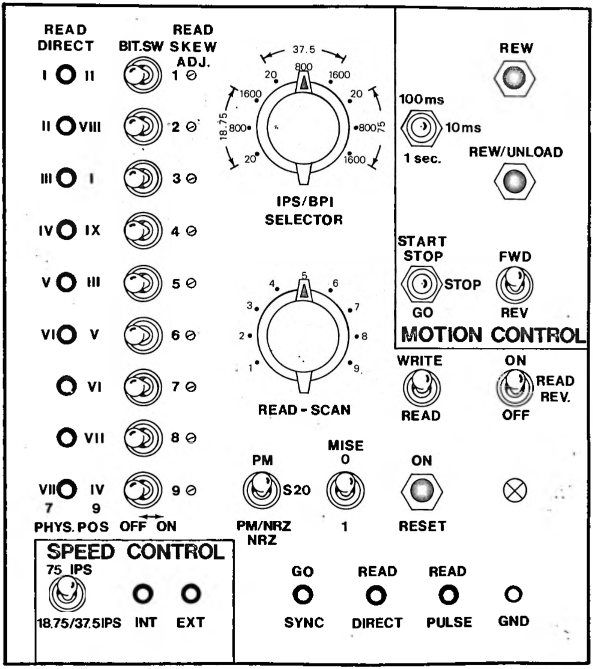

Fig. 3.4. – VAR 600 Field Tester Control Panel

3.6.1.1 - Handler Drive Control

The various drive control switches are situated on the MOTION CONTROL sector of the Field Tester panel.

CONTROL DEVICE		FUNCTIONAL DESCRIPTION
NAME	TYPE	
FWD-REV	2 way switch	Selects either the forward or reverse drive.
START/STOP STOP-GO	3 way switch	Selects the type of drive required: START/STOP - A drive phase is followed by an inoperative phase. STOP - Handler inoperative, REW and REW-UNLOAD are enabled. GO - Continuous drive.
100-10 ms 1 sec	3 way switch	Selects three START/STOP drive times. Figures represent the duration of each phase.
REW	Pushbutton	Rewinds tape till BOT marker is reached. This command can be inhibited by depressing the ON-RESET pushbutton.
REW/UNLOAD	Pushbutton	Commands a rewind and unload condition. Lights the operator panel UNLOAD pushbutton and upon conclusion of the rewind operation, the handler will return to the status it was previously set to after depressure of the ON pushbutton. This command can be inhibited by depressing the ON-RESET pushbutton.

3.6.1.2. - Write Control

The incorporated controls are:

CONTROL DEVICE		FUNCTIONAL DESCRIPTION
NAME	TYPE	
WRITE-READ	2 way switch	When on WRITE - enables both read and write operations. When on READ - only enables the read operation.
BIT SW	Nine 2 way switches	These switches, one per track, can either be set in position "1" or "0". When on "1" - enables the recording of a series of "ones" in NRZI or "ones and zeroes" in PM mode. When on "0" - Erases tape.
IPS/BPI SELECTOR	9 pos.rotary switch	Selects the read amplifier circuits and write strobes, depending upon handler speed and recording density.
READ-SKEW ADJ	9 pots	Used for Field Tester static read skew alignment. This operation is only necessary on handlers using PM recording systems.

3.6.1.3 - Read Control

Incorporates the following panel controls:

CONTROL DEVICE		FUNCTIONAL DESCRIPTION
NAME	TYPE	
READ DIRECT	Nine sockets	These sockets, one per track, are issued with read signals linearly amplified by the TRAL circuits.
READ SCAN	9 pos. rotary switch	Selects and forwards one of the 9 read signals to the READ-DIRECT socket and branching network comprised of the AMVA, ALFI, PIDE and DOSO PWBs.
READ DIRECT	Single socket	This socket is issued with that read signal selected by the 9 position READ-SCAN rotary switch.
S20	2 way switch	When set to PM position - Feeds the READ-PULSE signal through a one-shot having 9 READ-SKEW-ADJ pots which will be singularly selected by the READ-SCAN switch. Each track delay will be compensated by adjusting the pertinent pot. This enables a Field Tester static read skew alignment (on handlers using PM), so as to obtain correct static recording skew alignment. Furthermore the PAMI output is selected even if, for adjustment necessities, operation is in 800 bpi-NRZI mode. When in PM/NRZ - NRZ position - Inhibits the static read skew alignment one-shot, enabling both NRZ and PM operation modes.
MISE	2 way switch	When in position "0" - Selects the 800 bpi write circuits. If S20 is in the PM/NRZ - NRZ position, both read and write circuits at 800 bpi are selected. When in position "1" - Selects both read and write circuits at 1600 bpi.
READ REV	2 way switch	Selects the forward or reverse PARI channel during write signal level adjustments. When in OFF - Channel selection depends upon the drive mode. When in ON - Pre-sets the reverse channel selection.

3.6.1.4 - Capstan Speed Control

These controls, incorporated on the SPEED-CONTROL sector of the panel, are:

CONTROL DEVICE NAME	CONTROL DEVICE TYPE	FUNCTIONAL DESCRIPTION
INT	Socket	This socket is issued with the reference oscillator signal.
EXT	Socket	This socket is issued with the optical tachometer signal.
18.75/37.5 75 IPS	2 way switch	When on the 18.75/37.5 position - selects the 28.45 KHz square wave oscillator. When on the 75 position - Selects the 22.76 KHz square wave oscillator.

3.6.1.5 - Auxiliary Controls

CONTROL DEVICE NAME	CONTROL DEVICE TYPE	FUNCTIONAL DESCRIPTION
ON-RESET	Pushbutton	When depressed, the Field Tester is switched on and the handler is issued with a general reset status.
	Pilot lamp	Lights when the Field Tester is powered and is able to command the handler.
GO-SYNC	Socket	This socket is issued with the inverted tape drive mode command signal, necessary to sync the scope during START/STOP time checks.
GND	Socket	Scope ground connection.

3.6.2. - Operating Instructions

During Field Tester/GUN 150 connections, handler power is to be switched OFF.

3.6.2.1 - Field Tester Connection and Switch-On

Carry out operations in the following order:

- Connect the cable to the GUN 150 J10 connector.
- Set the ON-OFF LINE switch to position OFF (operator control panel).
- Depress pushbutton ON (operator control panel).
- Depress the Field Testers' ON-RESET pushbutton.

> Note
>
> From the moment the pilot lamp lights, the hanlder is under Field Tester control.

3.6.2.2 - Field Tester Switch-Off and Disconnection

If the Test Set is to be switched off but still left physically connected to the handler, it is necessary to depress the ON-RESET pushbutton and then set the handlers ON-OFF LINE switch to the ON position.

If on the other hand the Test Set is to be disconnected, proceed as follows:

- Depress the Field Testers ON-RESET pushbutton.
- Depress puhbutton OFF (operator control panel).
- Disconnect the cable from the GUN 150 J10 connector.

4. OPERATING DESCRIPTION

4.1. - GENERAL BLOCK DIAGRAM

This description refers to the GUN 150 general block diagram, Dwg.nº 14312055.

4.1.1. - Unit Selection Logic

Handler selection is accomplished by comparing the MTCs' coded selection signal with the handler name. If the comparison results positive, that handler will be addressed.

4.1.2. - Recording Density - Parity/Disparity Logic

Decodes and then stores the Set Density, Parity and Disparity command signals.

4.1.3. - Command Logic

Executes tape movement commands, forwards some status signals and detects both beginning and end of tape.

4.1.4. - Load and Rewind Logic

Enables and controls the execution of tape loading and rewinding operations.

4.1.5. - Servosystems

Enable and control reel and capstan motor drive.

4.1.6. - Read-Write Circuits

Generate write and pre-erasure head currents. These circuits also detect analogical read signals.

4.2. - INTERMEDIATE BLOCK DIAGRAM

This description refers to the GUN 150 intermediate block diagram, Dwg. n° 14312057.

Signal Names

Signal names are formed by 4 characters plus a termination character that will either be:

- NUMERICAL (1, 2, 3, 4 etc.) if the signal is a true signal, or
- ALPHABETICAL (A, B, C, D etc.) if the signal is a false signal.

Signal Location

During the description, this manual will indicate where the main signals can be found by indicating, in brackets, the page number followed by the reference coordinate.

4.2.1. - Selection Logic

4.2.1.1 - Comparison

This is a logic network that oversees the comparison between the selection code (bits AIFUU through CIFUU), issued by the control unit, and the handler (NU1ON through NU3ON). The handler identity is established by the position of the handler address selector switch.

MTH N°	AIFUU	BIFUU	CIFUU	NU1ON	NU2ON	NU3ON
1	1	0	0	1	0	0
2	0	1	0	0	1	0
3	1	1	0	1	1	0
4	0	0	1	0	0	1
5	1	0	1	1	0	1
6	0	1	1	0	1	1
7	1	1	1	1	1	1
8	0	0	0	0	0	0

1 = 0 V level

0 = +6 V level

The comparison will be clocked and conditioned by selection strobe TEUNU and by NUOO respectively. NUOO is at "0" if the ON-OFF LINE switch is in ON and if the SO interlock is closed (front unit door and sliding window closed). If the comparison results positive (equal), it will give rise to strobe UNSE (1A2); if on the other hand it results negative, it will give rise to strobe UNRE (1A2).

4.2.1.2 - Selection Storage

The moment a handler is selected, FF UNIT (1A2) will store the selection. This FF is set by UNSE and reset either by UNRE or by general reset REBU. UNITN at "0" enables both "commands" and "strobes" coming from the control unit and also enables those handler "status signals" issued to the controller.

4.2.1.3 - Selection Protection

Consists of a circuit that permits the MTC to be issued with signal NOSEU that establishes whether:

- No handler is selected
- Only one handler is selected
- Two or more handlers are selected simultaneously.

The circuit is comprised of PWB MATA (1A3) enabled by signal UNIT. The MATA output establishes the selection NOR (signal NOSEU) which will assume an out of standard level, as indicated by the pertinent table (1A3).

4.2.2. - Recording Density - Parity/Disparity Logic

4.2.2.1 - Density

The "Set Density" coded commands are put on the distributor channel and are timed with the command strobe TECOU. The density commands are decoded and stored in flip-flop DANU and DADU.
The general reset signal REBU, conditioned by signals NOZE and MOFA, which define the maximum delay at which the handler may operate, generates signals RENO (1B3) and REMO (1A2).
Through signal RENO, signal CORE is generated to reset flip-flops DANU and DADU, thus setting handler operation in Phase Modulation, whereas, by setting flip-flops DANU and DADU, signal REMO sets the High Density mode. The status of FFs DANU and DADU, conditioned by UNITN, determines interface signals IMO1U and IMO2U (1A2).
Furthermore, FFs DANU and DADU condition the selection of the read and write circuits, as described in para. 4.2.5.3/4.

4.2.2.2 – Parity/Disparity

These coded commands, gated to the distributor channel and strobed by TECOU, are decoded, and with clock COTEN respectively determine the setting and resetting of FF PARE (1B2). The status of this FF, conditioned by UNITN, determines interface signal PARIU.
General reset REBU, resetting FF PARE, sets the Disparity mode.

4.2.3. – Command Logic

4.2.3.1 – General Reset

Clock REBU (1A3) will be generated in the following cases:

- Every time the handler is switched on, through the +20 R voltage
- With clock REGEU coming from the MTC and conditioned by NUOO
- With clock RETIU coming from the Field Tester
- With signal LOSE during loading operations.

4.2.3.2 – Tape Drive

Through a logic network that oversees the storage of either the FWD or REV commands, signals AVANU (FWD/REV) and VIANU (RUN/STOP), conditioned by UNITN, set either SIND or SAVA (2A2) to logic level "1".
The same thing will occur through Field Tester commands AVATU and GOFIU.
SIND (reverse start) when at level "1", resets FF DIRE (2A2) that will consequently store the reverse drive mode and sets CINAN to "0" so as to enable reverse movement of the capstan motor.
SAVA (forward start) when at level "1", sets FF DIRE that consequently stores the forward drive mode and sets CAVAN to "0" so as to enable forward movement of the capstan motor.
When either SIND or SAVA return to "0", the capstan drive is disabled (CINAN and CAVAN at level "1"), AVION goes to level "1" and one-shot USTO is triggerred.
Depending upon the drive mode stored in FF DIRE, USTON either generates TODI or TORE that, during the up-time of USTO enables the capstan to turn in the opposite direction, causing the halting of the tape.

4.2.3.3 – Read Circuit Selection

As a read or write tape movement command is issued, signal GOGON (2A1), in turn conditioned by UNITN, sets SELE to level "1" and SELEN to "0" which enable the TRAL PWB outputs towards the T2E interface.

If the command is issued by the Field Tester, with UNITN at level "1", SELE will go to "0" and SELEN to "1" in turn disabling the TRAL PWB outputs towards the T2E interface.
The TRAL outputs towards the FT (Field Tester) interface are always enabled.
Read circuits will be enabled by signals VAVON (2A1) and MISE (2B2).

P.M. Density

When this density is stored (DANU and DADU at "0" level), MISE is at "1" therefore BAFO and BARE are at "0" and MISU (2B3) is at level "1".
BAFO and BARE disable the PARI inputs (only present on handlers using PM + NRZI modes).
MISU will enable the PAMI PWB signals to the inputs of the TRALs.

NRZI Density

When this density is stored (DANU and/or DADU at level "1"), both MISE and MISU will go to "0" level.
Signal MISU enables the TRALs with those signals coming from boards PARI, while it disables the outputs of the PAMI.
If the handler is in the FWD drive mode (VAVON = "0"), BAFO goes to level "1" and BARE to level "0" consequently selecting the forward PARI channel.
If in REV drive (VAVON = 1), BAFO goes to level "0" and BARE to level "1", consequently selecting the reverse PARI channel.

Through Field Tester signal INDO (2B2), the reverse PARI channel may still be selected even if the handler is in FWD drive mode.
Another Field Tester signal, MIFI (2B2), enables to set MISU to "1" and again through Field Tester command, MISE can be set to "0".

4.2.3.4 - Write Circuit Selection

The issue of MTC signal REGIU, conditioned by UNITN, sets FF SERU (1B3) which will hence store the write selection.
SERU may also be set through Field Tester signal REFIU.
The write selection is disabled only in case of an inversion in tape drive (Rewind or Read Reverse) or with the general reset signal.
Signals utilized to reset flip-flop SERU are RIAV and RENI.
SERUA at "0" enables the AMRU PWBs.

4.2.3.5 - Status Signals

STAND BY

The set condition of flip-flop PEUN (2A2) indicates the machine condition of "Stand By", while when in reset, the flip-flop gives the "Operate"status.

PEUN can either be set by the STAND-BY operator control panel pushbutton, signal SBAM, or by the OR of MARE and NUOO.
PEUN can be reset by signal SOPE or by BOBA•RIAV when, during loading operations, the BOT marker is sensed.
When OPERATE is depressed, with the ON-OFF LINE switch in ON if the handler is running (MARE at "0") and not in rewind (01RI at "0"), SOPE goes to "1".
PEUNN at "0", enables the EOTO and BOTO signals which act upon the generation logic of the SIND and SAVA signals (2A2) that in turn enable the movement of tape.
With PEUN at "1", the out of service signal MAREU is pre-set.

MAREU

This status is given by MARIN (1B1) at "0", in the following cases:

- With CIOP, upon reception of a Rewind and Unload command
- With PEUN, by positioning the handler in Stand-By
- With MARE, whenever a malfunction arises.

The last condition, malfunction signal MARE, will arise in any of the following circumstances:

- During Rewind and Unload operations, when the BOT marker returns under the photosensor (ERCO)	
- When the photosensor lamp is out	(BELA)
- When the tachometer lamp is out	(TALA)
- When the fluorescent lamp is out	(SILA)
- Pneumatic differential interlock open	(BATA)
- Pneumatic reference interlock open	(VASA)
- Upper bin cover interlock open	(COMAN)
- Packer arm interlock open	(COMAN)
- When the RL1 relay is not energized	(MALE).

MAPEU

This status is given by MAPEN (1B1) at "0" in the following cases:

- With MARE, if the handler is in an Out of Service status
- With RIAVN, if the handler is not in the Rewind status.

NOVIU

Given by NOVI (1B1) that is generated with SENO at "0" (9 track handlers), conditioned by UNITN.

NORIU

Given by NORI (1B1) that is generated with PAMO at "0" (handlers with NRZI option), conditioned by UNITN.

INREU

This status is given by INREN (1B1) that is generated with INIR2 at "0" (handler in Inhibit Write status), conditioned by UNITN.

4.2.3.6 - Beginning of Tape

When the BOT marker is sensed, FOINN goes to "0" and if PEUNN is at "0" (handler in Stand-By) sets BOTO to "1" (2A3).
BOTO inhibits the issue of any Rewind command or immediately stops tape movement if such a command is running.
Furthermore FOINN, conditioned by UNITN, at "0", gives rise to interface signal BOTAU (1B2).

4.2.3.7 - End of Tape

When the EOT marker is sensed, FOFIN goes to "0" and if PEUNN is at "0" (handler in Stand-By), sets EOTO to "1" (2A3).
EOTO inhibits the issue of any Forward command or will immediately stop tape movement if such a command is under way.
If the marker is sensed during FWD Drive (FOFIN·GOGON·01IN), SETE goes to "1" and through the setting of FF FINA (1B2), the End of Tape signal is stored.
With FIFAN at "0", conditioned by UNITN, interface signal TESEU is issued.
Signals REBU and POFI will reset FF FINA.
POFI will go to "1" when either the EOT marker is sensed during reverse tape movement, REFI (1B1) at "1", or with a Rewind command, RIAV at level "1".

4.2.4. - Load and Rewind Logic

4.2.4.1 - Load

When pushbutton LOAD is depressed, LOADN goes to "0", which, in AND with COMAN and MAREN, set LOSE (2B1) to "1". This in turn, will set FFs LOTO and FOLO (2A1).
LOTON at "0", triggers one-shots RILO and LOLUN which span the time within which the handler must enter into the "operate" status.
Relays RL1 and RL2 (ALI 040) will be energized when LOTO sets REMA to level "0".
RL2 supplies the vacuum motor, while RL1 supplies the reel brakes solenoids and sets MALE to "0".
When MARE goes to "0", FOLO sets SAVA (2A2) to "1" so enabling the capstan motor to rotate in the FWD mode. As LOLU falls flip-flop LOTO falls, but REMA will only stay at "0" if the handler has gone in "Operate" with signal MAREN at level "1".

If after the fall of LOLU, LODAN is at "0" (pushbutton depressed), one-shots RILO and LOLU trigger once again, subsequently resetting LOTO in case MAREN is still at "0".
The reset of FF FOLO stops tape movement. FOLO resets with FOIN at "1", when the BOT marker is sensed or with SBAM at "1", when the STAND-BY pushbutton is depressed.
When the loading operation is accomplished, with FOIN at "0" one-shot BOBA (2A1) will fire. If, when BOBA falls, NUOO is at "0", FF PEUN (2A2) sets. This flip-flop switches the handler to the OPERATE status.

4.2.4.2 - Rewind

When the MTC issues a Rewind command, AITE is set to "1" and therefore RIVAN will be at "0". The same thing occurs when the command is issued by Field Tester signal RIATU.
Conditioned by FOIN, RIVAN sets ARIA to "1" and sets FF RIAV (2A1).
During manual rewinding operations, RIAV will be set by SERI.
With RIAV, conditioned by FOLO·BOBA·FRIA·MARE, at "0", O1RIN is also at "0" and enables the capstan to rotate in REV mode at roughly 300"/sec.
Upon sensing of the BOT marker, one shots BOBA (2A1) and FRIA (2A3) will trigger.
FRIA at "1" sets O1RIN to "1" which de-energizes the capstan motor.
During the whole up-time of FRIA, the capstan motor will continue to rotate through inertia. At the fall of FRIA, FF FOLO will set enabling thus FWD drive to the capstan. By this inversion of the capstan drive mode, movement will stop just in the same way as it occurs when the BOT marker is sensed during loading operations.
BOBA will reset RIAV if MAMAN is at "0". BOBA is generated when FOINN goes to "0" or at the fall of FRIA if FOINN is at "0".
This last condition guarantees the resetting of RIAV in case tape stops with the BOT marker under the photosense unit during a REV phase operation.
In fact, because of FOIN at "1", FF FOLO would remain in reset at the fall of FRIA. With RIAVN at "0", O1RIN is also at "0", consequently, if the above mentioned condition were not existant, the handler would go into Rewind and unthread the media.
RIAV can also be reset by REBU or SORI when in Out of Service (MARE at "1"), or by depressing pushbutton STAND-BY (SBAM at "1").
When the handler is in Rewind and Unload, BITE goes to "1" and RIVAN to "0"; a condition that also occurs with Field-Tester Rewind and Unload signal SCATU.
BITE and SCATU place SECI to "1" and by setting FF CIOP (1B2), light the UNLOAD pushbutton on the operator control panel.
Conditioned by FOIN, RIVAN places ARIA to "1" and sets FF RIAV.
Tape movement is produced just as in the Rewind description above.
When tape motion stops on the BOT marker, ERCO (2A3) at "1" places the handler in the Out of Service status.

Flip-flop CIOP is reset with REBU or, during a new loading operation, with signal LOSE.

4.2.5. - Servosystems

4.2.5.1 - Vacuum Bin Lamp Circuit

The vacuum bins fluorescent lamp is AC powered at a frequency of 20 KHz through a Bodine oscillator.
Fig. 4.1. shows the power supply schematic for this lamp.

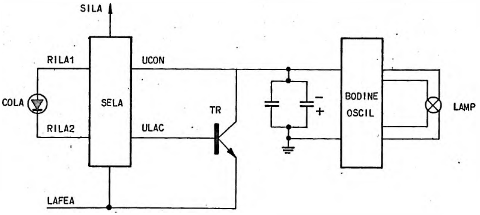

Fig. 4.1. - Fluorescent Lamp Supply Circuit

Control photodiode COLA drives SELA that, by varying the oscillators power supply, ensures constant lamp brightness and avoids damage or excessive lamp deterioration.
Through adequate PWB SELA (2A3) pot adjustment, the oscillators power supply may be set to the level required for proper servo-reel functioning.
SELA output signal ULAC, controls the TR "series" transistor that is supplied by the -24 V voltage (LAFEA).
In case of any lamp failure SILA goes to "1", placing the handler in the Out of Service status and holding FF LOTO (2B1) in reset, so as to impede loading operations.

4.2.5.2 - Capstan Motor Circuit

Figure 4.2. illustrates the block diagram of the capstan motor supply circuit.

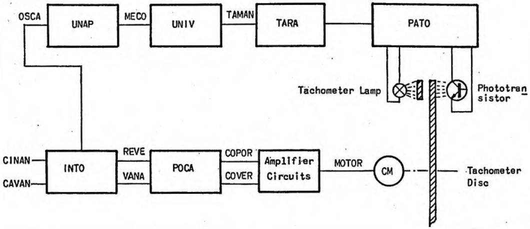

Fig. 4.2. - Capstan Motor Supply Circuit

The optical tachometer group generates a sine-wave the period (T) of which is proportional to the motor speed.
Level can vary from 50 to 150 mV. See figure 4.3..

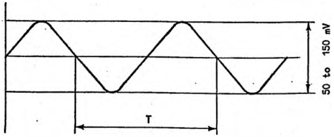

Fig. 4.3. - Phototransistor Output Signal

This signal, TAMA, is then fed to board PATO which is physically mounted on the motor itself.
The amplified signal is shown in the figure below.

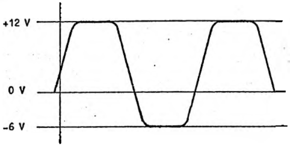

Fig. 4.4. - PATO Output Signal

Signal TAMA is squared and limited to the required level by PWB TARA whose output, signal TAMAN, is utilized to trigger one-shot MECO.
This produces a succession of clocks having a period (T) proportional to the speed of the motor to trigger the precision one-shot OSCA (UNAP).
The period of UNAP is shorter than the tachometer clocks period "T", therefore OSCA has a variable "S" period which will be dependent upon the "T" period variations, hence the motor speed. See Fig. 4.5..
Board INTO integrates signal OSCA, giving a control voltage the level of which is proportional to the portion "S" of signal OSCA.
Signals CAVAN and CINAN select the FWD and REV INTO channels respectively.

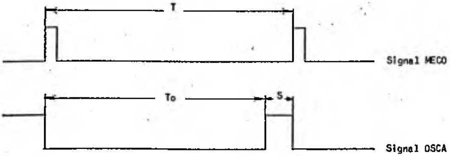

Fig. 4.5. - Capstan Timing Signals

The INTO outputs, signal VIANA (FWD drive) and REVE (REV drive), will assume a voltage level which will be dependent upon the period of OSCA.
Board POCA amplifies signals VANA and REVE, outputting signals COFOR and COREV which in turn respectively control the capstan motor FWD and REV drive power circuits.
Signal TAMA is inhibited at the start and at the end of a tape movement for the entire period of one-shot INTA (2B1).
During this period the capstan motor will be driven with constant acceleration or deceleration so as to avoid excessive stress on the tape.
Rewind signal 01RIN acts directly on PWB POCA, causing a constant voltage reverse movement.

4.2.5.3 - Reel Motors Circuit

Figure 4.6. illustrates the reel motors servoing circuit.
The light emitted by the bin lamp is collected by the light pipe which, being partially covered by the media, will be subjected to a quantity of light proportional to the height of the tape loop within the bin.

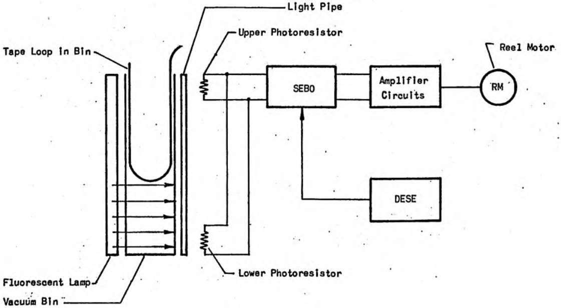

Fig. 4.6. - Reel Motor Drive Circuit

The photoresistors, located on the two extremities of the light pipe, are part of the SEBO PWB current amplifiers input circuit.

Light variations, caused by tape movements in the bin, give way to current changes that amplified by SEBO, enable to control the reel motor power circuits.

During loading operations the SEBO boards, one for each reel motor, are enabled by signals COTA1 at "1" (upper reel motor) and COTA2 at "1"(lower reel motor).

COTA1 goes to "1" when, after the energizing of RL1 (MALE1 at "1"), the pneumatic reference interlock S1 is made (VASA1 at "1").

COTA2 goes to "1" when, after the energizing of RL1 (MALE1 at "1"), both the reference S1 (VASA1 at "1") and the out-of-service S3 (POSI1 at "1") pneumatic switches are made.

Applied to the inputs of the lower motor SEBO board are FOPO and FOPA, generated respectively by photoresistors FOSS and FOIS.

The outputs of board SEBO, signal PIBI for clockwise rotation and signal PIBO for counter clockwise rotation, are utilized to drive the motor power circuits.

Applied to the inputs of the upper motor SEBO board are FOPI and FOPE, generated respectively by photoresistors FOSD and FOID. The outputs of this SEBO board, signal PIBE for clockwise rotation and signal PIBA for counterclockwise rotation, are utilized to drive the motor power circuits.

Sawtooth signal DESE sets the length of the drive signals.

4.2.6. - Read/Write Circuits

4.2.6.1 - Read Circuits

These circuits, as illustrated in Fig. 4.7., comprise the following PWBs:

- PAMI : linear amplifier
- PARI : read head alignment
- TRAL : power transmitter.

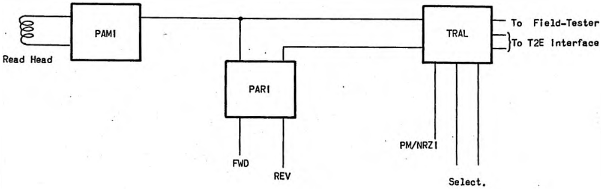

Fig. 4.7. - Read Circuit Block Diagram

PAMI

This is a linear amplifier that amplifies and limits the magnetic head signals to a 2 V pp. level through a gain pot. This adjustment is necessary to compensate head tolerances and amplitude variations that arise with different handler speeds.

PARI

This comprises a delay line which enables to transversally realign the signals of the various tracks, consequently compensating the static skew of the magnetic head.

It has two amplifier channels (one for the forward and one for the reverse drive mode) that, through adequate gain pot adjustment, compensate the attenuation differences caused by the delay line.
Delay settings are accomplished with jumpers.

TRAL

This is a power transmitter that drives the MTH/MTC connection cable.

The read circuit selection is described in para. 4.2.3.3.
TRAL signals APAT/MITA constitute the outputs towards the Field Tester, AIFEU/MIFEU the outputs towards the MTC whereas AIFE9/MIFE9 constitute the return grounded to the TRALs.
The PARI boards are only fitted on those handlers having the NRZI option.
On 7 track handlers all the GIFEU and LIFEU bit boards will be missing.

4.2.6.2 - Write Circuits

These circuits, as can be seen in Fig.4.8., comprise the following PWBs:

- URES : head alignment one-shot
- AMRU : write flip-flop
- CADI : calibration resistance

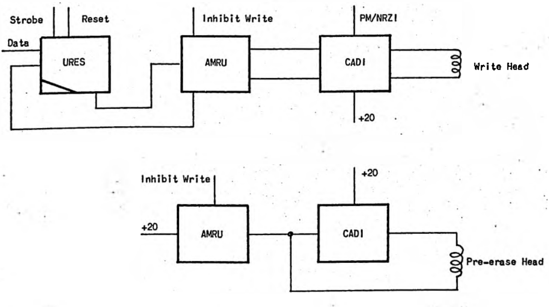

Fig. 4.8. - Write Circuit Block Diagram

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Consists of a fast recovery one-shot whose up-time is pot adjusted so as to enable the compensation of the write head static skew, through realignment of the various tracks.

AMRU

Is a flip-flop that drives the two write current switches.

CADI H

Consists of the write current calibrating resistors and a circuit that varies this current, which will result greater when in NRZ and smaller when in the PM mode.

CADI F

This is fitted with the pre-erase head calibrating resistor.

Strobed by RETEN (2A3), signals AIPUN to MIPUN trigger the respective URES, RE011 to RE091, which in turn switch FFs AMRU.
SERUN at "0" selects the AMRU flip-flops.
INIR at "1" disables PWB CADI consequently inhibiting the write function.
Clock RERON (2B3) is used to reset the AMRU flip-flops which, in turn, trigger the URES one shots. These, being in set, have signals RE111 to RE191 at level "0".
If the recording density is PM (1600 bpi), signal MISED at level "1" is utilized to vary the write current by acting on boards CADI.

4.3. - MECHANICAL DESIGN

The handlers tape transport, as illustrated in Fig. 4.9.a) and b), comprises the following assemblies:

- Tape transport assembly
- Vacuum bins and motor assembly
- Fluorescent lamp assembly
- Head assembly
- Photosensor assembly
- Auxiliary assemblies.

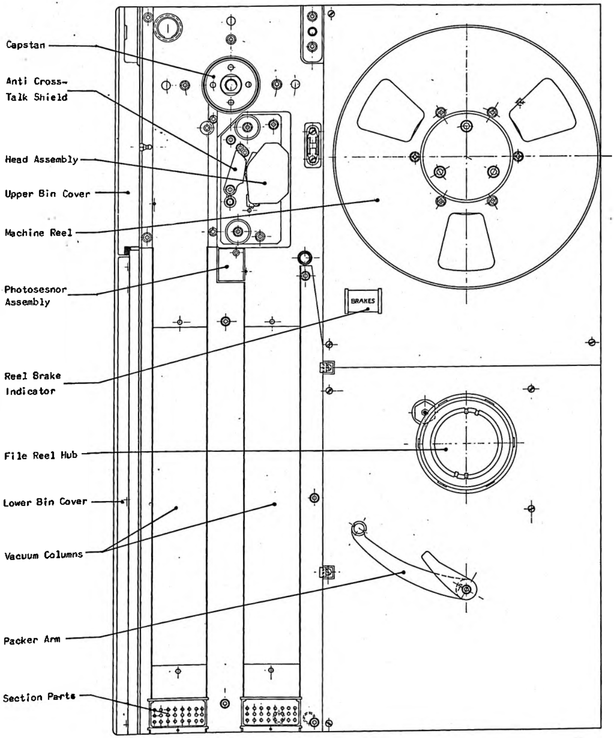

Fig. 4.9. a – Tape Transport (Front View)

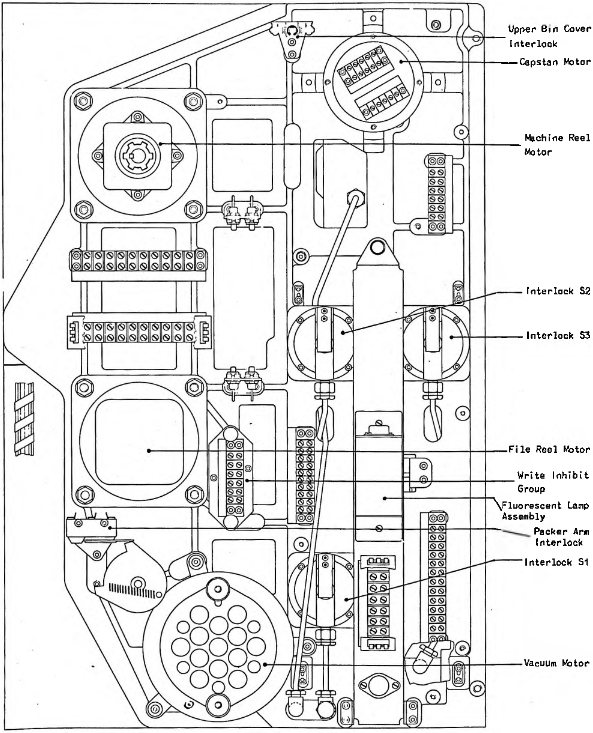

Fig. 4.9. b. - Tape Transport (Rear View)

4.3.1. - Tape Transport Assembly

The tape transport consists of the following:

- Capstan motor
- Capstan
- Reel motors.

4.3.1.1 - Capstan Motor

The capstan motor is a low inertia DC motor whose speed is controlled by an optical tachometer.
An exploded view of the motor is given in Fig. 4.10., which also shows parts of the tachometer group.
The tachometer disc is an annulus having photo-etched transparent segments on its periphery. The number of these segments varies depending upon the type of motor used.

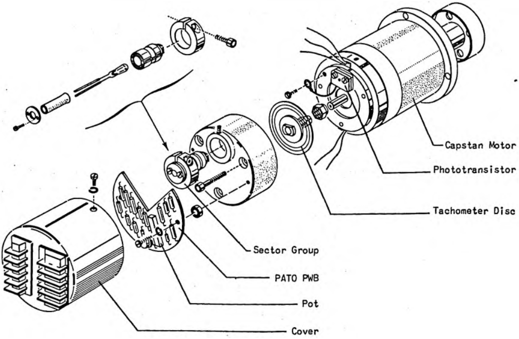

Fig. 4.10. - Capstan Motor and Tachometer Group

The sector mask, made from a photo-etched disc, is glued to a bushing that may be rotated to give fine adjustments.
The tachometer group also comprises of the PATO board used to amplify the phototransistor signals.
Other motor characteristics are given in the table below.

TAPE MOVEMENT SPEED	TACHOMETER DISC GROOVES	MOTOR SPEED	
		RATED	REWIND
18.75"/sec	5000	170 rpm	2720 rpm
37.5 "/sec	5000	340 rpm	2720 rpm
75"/sec	2000	680 rpm	2720 rpm

4.3.1.2 - Capstan

Consists of a single rubber covered cylinder keyed to the motor shaft through a split looking cone, as illustrated in Fig. 4.11..

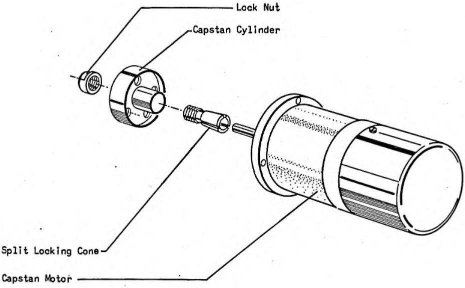

Fig. 4.11. - Capstan and Locking Cone Group

The capstan and its locking cone form a unique group.

4.3.1.3 - Reel Motors

These are DC series motors with two windings, one for the CW and the other for the CCW rotation.

The motors are braked by an electromechanical brake group, fitted on the rear part of the motor shaft. See Fig. 4.12.. The motors are mounted on the handler casting with their shafts protruding, thereby giving direct drive to the reels.

Motor drive is controlled by the tape loop position sensed by the photoelectric system in the vacuum columns.

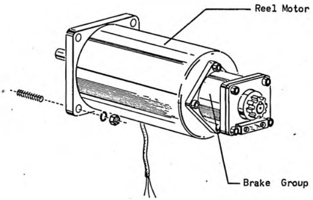

Fig. 4.12. - Reel Motor

4.3.2. - Vacuum Bin and Motor Assembly

The assembly is made up of two vacuum columns and a vacuum pump, as illustrated in Fig. 4.13..

The internal wall and external panel are made of glass.

The internal wall must be absolutely transparent so as to enable the bin lamp light to be detected by the pertinent devices that oversee the reel motor control. The external panel, though of metalized glass so as to avoid external light influence, must still enable sufficient vision of the media.

The side walls are fitted with a light pipe which, through the pertinent phototransistors, receives the light variations that permit the driving of the reel motor circuits.

Closure of the upper bin cover enables the tape to be drawn in the vacuum

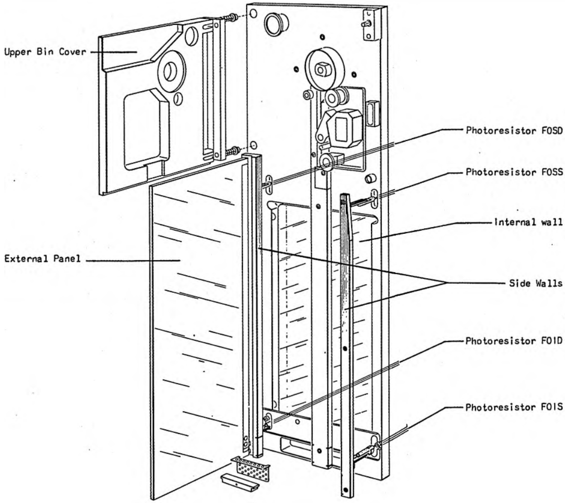

Fig. 4.13. - Vacuum Bin Assembly

columns during loading operations.
The vacuum motor will ensure a 600 to 830 mm Hg pressure inside the vacuum columns so as to impart a tension of 225 to 275 g onto the tape, in order to obtain the satisfactory friction coefficient between capstan and the tape wrapped round it.

4.3.3. - Fluorescent Lamp Assembly

This assembly is housed behind the tape transport and the internal bin wall. See Fig. 4.14..
The lampholders are fitted on a vertical hinged support so as to enable easy lamp changes. The support also mounts the power transistor and the Bodine oscillator.
Fixed on the main casting and beside the fluorescent lamp, there is the control group that comprises a light pipe fitted with photodiodes.

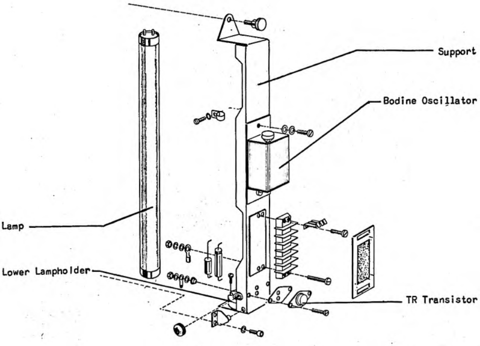

Fig. 4.14. - Fluorescent Lamp Assembly

4.3.4. - Head Assembly

As illustrated in Fig. 4.15., the head assembly is composed of the following:

- Read and write heads
- Tape Cleaners
- Tape Guides

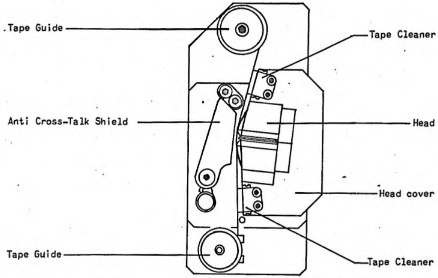

Fig. 4.15. - Head Assembly

4.3.4.1 - Read/Write Heads

Figure 4.16. shows the detailed parts that make up a magnetic head.
Each read and write head track is comprised of a toroidal shaped pack of metal laminations. These are highly resistive to friction, have high permeability and offer high electrical resistance so as to limit the heat induced by parasite currents.
Each pack of laminations is separated by a shield to reduce track to track interference. The read and write heads are also shielded from each other.

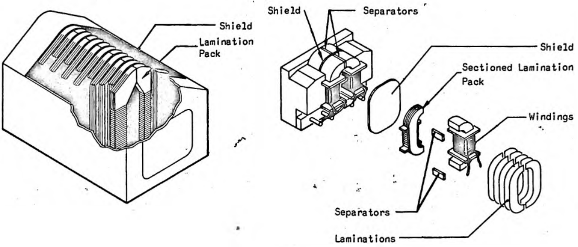

Fig. 4.16. - Magnetic Head Assembly

The magnetic heads are mounted on a precision plate. The pre-erase head is fitted just in front of the write head (only on 9 track assemblies).This section is wide enough so as to enable the erasure of the entire media width. The head assembly group is also fitted with an anti cross-talk shield,having a lamination pack in corrispondence with the write head, that cuts down the flux dispersions avoiding interference with the read head.

4.3.5. - Photosensor Assembly

This assembly is composed of a lamp and two photodiodes that, housed on the central wall just outside the right hand vacuum bin, senses both the BOT and EOT reflective strips.
The bin lamp beam is directed towards the media and, when the reflective strips arise, is reflected to the photodiodes that then issue the BOT and EOT status signals.

4.3.6. - Auxiliary Assemblies

Comprising the following devices:

- File reel lock
- Write Inhibit group
- Reel motor brakes
- Packing arm
- Out of Service interlock
- Reference interlock
- Upper bin cover interlock
- Front handler door interlock
- Rear handler door interlock

4.3.6.1 - File Reel Lock

This device is fitted on the lower reel motor and enables easy installment and removal of the file reel from the hub.
As can be seen in Fig. 4.17., it is comprised of the actual hub itself, ring and shoe assembly, cam and lock knob.
Turning the lock knob CW, the cam pulls the disc towards it and squeezes the ring and shoe assembly producing a sufficient ring expansion to secure the reel.
Turning the lock knob CCW enables to free the reel exactly in the opposite way as described above.

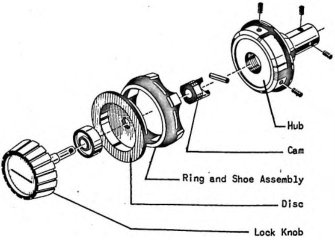

Fig. 4.17. - Reel Lock

4.3.6.2 - Write Inhibit Group

The composition of this group is illustrated in Fig. 4.18..
The group is made up of a relay on whose armature is fixed a lever actuated by the sensor plunger. The sensor is installed beside the lower reel hub and signals whether the write permit ring is fitted on the supply reel. See Fig. 4.19..
If the ring is present, the sensor, through the moving lever, will energize the relay which incorporates its own hold-on contacts.
The other pair of relay contacts set signal INIR2 to "1" which issues the DEM with an Enable Write signal.
When on the other hand the write permit ring is not fitted, the relay is no longer energized. Signal INIR2 remains at "0" and issues a Write Inhibit signal to the DEM, causing the FILE PROTECT pushbutton, on the operator control panel, to light.

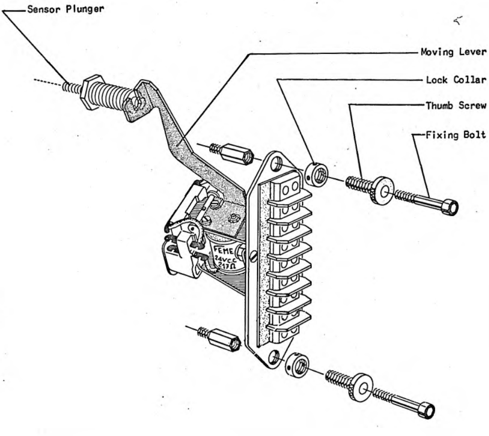

Fig. 4.18. - Write Inhibit Group

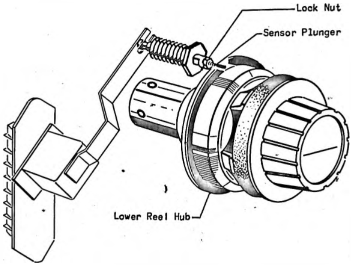

Fig. 4.19. - Sensor Group

4.3.6.3 - Reel Brakes

These groups are fitted on the rear part of each reel motor shaft and, as can be seen in Fig. 4.20., consist of the following parts:

- Brake housing, fitted with the command solenoid
- Pressure spring
- Spring loaded plate, free to move axially
- Brake disc, with friction material
- Splined shaft
- End plate.

The brake disc is keyed to the splined shaft and positioned between the spring loaded plate and end plate.
The stopping or blocking action is produced by the amount of exerted spring pressure with which the brake disc is forced between the spring plate and end plate.
When the brakes are on, the condition will be visualized through the BRAKES indicator situated on the handler casting. See Fig. 4.9.a).

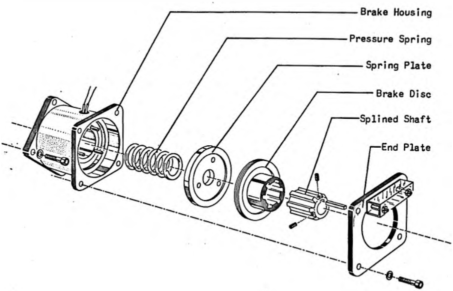

Fig. 4.20. - Reel Brake Group

4.3.6.4 - Packing Arm

The tape packer arm consists of a spring loaded lever having on its extremity a neoprene cylinder fitted between two steel shells, one of which acts as a shoe or skid.
The pressure exerted by the spring is about 65 grams, sufficient to keep the pad contacting the winding tape.
When the packing arm is lifted from the tape and brought to its idle position, it opens the S5 interlock contacts that will consequently inhibit any loading operations. This tape packer device allows better packing of the media and forces out any possible air pockets that form between the coils.

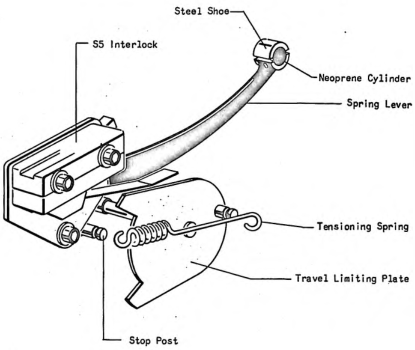

Fig. 4.21. - Tape Packing Arm

4.3.6.5 - Out of Service Interlocks S2 and S3

These are two differential pneumatic switches that place the handler in the Out of Service status whenever the tape reaches a limit condition in the vacuum columns.

There are two limit sensors, one situated on the upper and one in the lower part of each column.

As illustrated in Fig. 4.22., the interlock switch is composed of a central body fastened to the casting, a diaphram, plunger, return spring and a contact group.

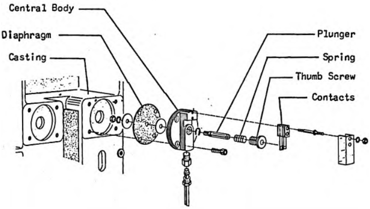

Fig. 4.22. - Pneumatic Interlock Switch

The swith is called upon to operate :

- Under normal running conditions (tape loop positioned between the two limit sensors).

  When the vacuum level, overcoming the tension of the return spring, forces the diaphragm to hold the switch contacts closed through the plunger.

- When the tape loop goes beyond the lower limit sensor.

  Vacuum pressure will no longer act on the tape and the diaghragm, forced to its idle position through action of the return spring, causes the switch contacts to open.

- When the tape loop goes beyond the upper limit sensor

  Vacuum pressure will be applied to both sides of the diaphragm which will consequently be forced to its idle position under action of the return spring.

4.3.6.6 - Reference Interlock S1

The purpose of this switch is to place the handler in an operating condition when sufficient bin vacuum has been reached upon tape loading operations. This switch also releases the brakes when the vacuum pressure is no longer sufficient to draw in the tape loop so as to avoid undue crumpling of the media during unloading operations.
The interlock is activated when bin vacuum reaches roughly 70% of its nominal value. Fitted with an adjustment thumb screw, the switch can be set to any desired operating point.

Apart from the group of contacts, this interlock switch is identical to the Out of Service switch described in para. 4.3.6.5..

4.3.6.7 - Upper Bin Cover Interlock S4

As illustrated in Fig. 4.23., this interlock is composed of a three positional plunger that commands two microswitches. The plunger is normally actioned by the upper bin cover but can also be actioned manually, when tape movement control is to be done with the bin cover open.
The purpose of the interlock is to prevent tape loading operations when the bin cover is open; in fact if this were the case, the handler would be placed in the Out of Service status. However, if a tape movement check with the bin cover open is required, the handler may be made to function by manually extracting the interlock plunger. In this condition though, only if sufficient tape loops are already in the columns will it be possible to effect a loading operation as the media would not be drawn in the bin.

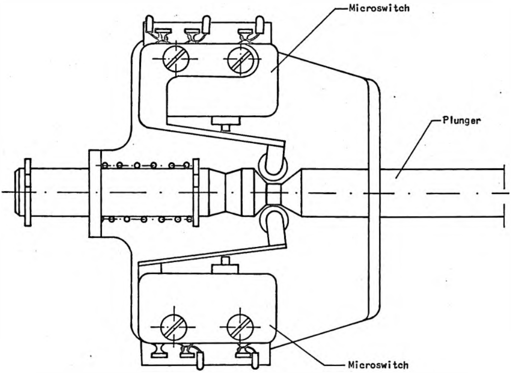

Fig. 4.23. - Upper Bin Cover Interlock

4.3.6.8 - Front Handler Door Interlock SO

This interlock is built in the front door and sliding window to prevent the handler from being placed in the OPERATE status in case the above are left open.

4.3.6.9 - Rear Handler Door Interlock SO1

The microswitch is activated, and prevents the handler from being switched on, whenever the rear door is open.
If necessary however, the switch plunger can be pulled out so as to simulate the closed door condition.

4.4. - POWER SUPPLY

4.4.1. - General

The Power Supply provides the following voltages:

DC VOLTAGES		AC VOLTAGES
+20 V	+20 VR	97 V
-20 V	+23 V	20 V
-24 V	-5.5 V	
+48 V		

The Power Supply is the same for both the 220 V - 50 Hz and the 208 V -60 Hz versions. When passing from one mains supply to another,it will be necessary to change the lapsed time counter and the wiring connections on the primary windings of transformers T1, T2 and T3.

4.4.2. - Electrical Characteristics

4.4.2.1 - Input

DESCRIPTION	LIMITS
3 phase mains without neutral	220 V - 50 Hz or 208 V - 60 Hz
Mains voltage variations	± 10% max.
Mains frequency variations	± 5% max.
Current drain } With nominal mains and load	Phase X = 4,4 A - Y = 3,25 A - Z = 3,25 A
Cos φ	Phase X = 0,78 - Y + 0,9 - Z = 0,9
Power drain (with nominal mains)	1,1 kW max.

4.4.2.2 - Output

- DC voltages

VOLTAGE	AMPS.	DESCRIPTION
+20	4,3	Supplies the Electronics module. Output is stabilized to ± 2% of nominal value, with 50 to 100% load variations and mains variations as per para. 4.4.2.1. With max load and mains at +10%, ripple must be ⩽ 10 mV.
+20 VR	2	Supplies the Electronics module. Derived from the +20 V through a delay relay.
-20	0,5	Supplies the Electronics module. Output is stabilized to ± 2% of nominal value, with 50 to 100% load variations and mains variations as per para. 4.4.2.1. With max load and mains at +10%, ripple must be ⩽ 10 mV.
± 23	8	Supplies the capstan motor.
-24	2,5	Supplies the fluorescent lamp, main breaker and brakes.
-5,5	0,5	Supplies photosensor and optical tachometer lamps.
+48	6	Supplies the reel motors.

- AC Voltages

VOLTAGE	AMPS.	DESCRIPTION
97		Supplies the vacuum motor.
20		Supplies the sawtooth signal generator (PWB SELA)

4.4.3. - Theory of Operation

The Power Supply furnishes 3 non stabilized DC voltages: +23 V, -23 V and the +48 V, derived from three-phase bridge rectifiers and filter capacitors; and 4 stabilized DC voltages: +20 V, -20 V, +20 VR and -5.5 V. The +20 and -20 V are stabilized within 2% of nominal value with "series" adjustment circuits.

Apart from certain component values and the number of mounted power transistors, these two circuits are basically identical, each being composed of an output voltage stabilizer and current limiter.

The +20 VR is derived from the +20 V through a delay relay, while the -5.5 V is derived from the -20 V through a Zener diode.

The Power Supply also comprises the following auxiliary circuits:

- Voltage protection
- Phase fall protection
- Overtemperature protection

4.4.3.1 - Output Voltage Stabilization

The stabilizing circuit compares a portion of the output with a constant reference voltage. The result of the comparison gives rise to an "error voltage" that varies with the actual output itself.

The stabilized output is obtained as follows:

- If the output voltage decreases, either because of a decrease in the input voltage or a rise in the output load current, the error voltage also tends to decrease. The series transistor is driven harder in order to bring the output voltage to its nominal value.

- If the output increases, either because of an increase in the input voltage or a decrease of the output load current, the error voltage now rises. This decreases the conduction of the series transistors so as to bring the output voltage back to its nominal value.

4.4.3.2 - Output Current Limitation

The Power Supply will only stabilize the +20 and -20 V if the load current does not reach the specified maximum values.

If the load requires a greater current level, the Power Supply changes its functional characteristics and behavesas a constant current generator and no longer as a constant voltage generator.

To accomplish this, the output voltage decreases with the decrease of the load resistance until a 0 V level is reached. The output is pratically short circuited.

The generated current limiter senses the value of the load current through a

low value resistor, series connected to the output.
The voltage drop across this resistor in therefore proportional to the generated current but, being rather small, has to be amplified to a suitable working level.
When the output current reaches a given value, the voltage drop across the resistor goes to a fixed level that, after amplification and independently from the error voltage, drives the series transistors so as to obtain a constant max current output. The output voltage is therefore dependent upon the load.
The max current can be adjusted through a rheostat.

4.4.3.3 - Voltage Protection

If the below listed variations are imposed on the following voltages, the Power Supply is automatically switched off.

VOLTAGE	VARIATIONS
+48, +23	Negative variations of 25 to 30% from nominal
-23, -24	Positive variations of 25 to 30% from nominal
+20, -20	Positive and negative variations of 10% from nominal

The +48, +23, -23 and -24 V operating points are established with preset dividers, while the +20 and -20 V operating points can be pot adjusted.
Each protected voltage has a divider, the output of which is fed to a level discriminating differential amplifier. There are two of these differential amplifiers, one for the negative and one for the positive variations, the ORED outputs of which control the RL3 command circuit. When de-energized, this relay causes the Power Supply to switch-off.

4.4.3.4 - Phase Fall Protection

This circuit consists of a rectifier bridge, the output of which goes to an instantaneous zero level whenever a mains phase falls. This causes the conduction of a controlled diode which in turn drives the command circuit.

4.4.3.5 - Overtemperature Protection

The Power Supply is equipped with an overtemperature protection device that controls the heat level on the transformers, the +20 V heat sinks, capstan and reel motor power circuits.
It comprises six series connected thermoswitches which act upon the RL3 relay command circuit. Whenever a thermoswitch opens, RL3 is de-energized and power is removed from the equipment.

4.4.4. - Functional Description

For this description, refer to Dwg. nº 14432940, chapters:

- 2219: for service and command circuit diagrams
- 2220: ± 23 and +48 V Power Supply circuit diagrams
- 2221: ± 20 and -5.5 V Power Supply circuit diagrams.

During the description, reference coordinants are given, in brackets, to easily locate main components.

4.4.4.1 - Mains Distribution and Command Circuits

The 3 phase AC mains supply is applied to connector J22 and from here can be directly derived to supply the next handler on connector Y22.
Between the connection of J22 and Y22, two phases are inverted to obtain partial load balancing on the primary supply input.
Filtered by L2 and L3 (A2), the mains supply is now fed to transformer T2 (B2) whose secondary, through the D19 to D24 bridge rectifier and C1 filter capacitor, supplies the -24 V. Through the open contacts 15-16 of main breaker TL1 (B3), the -24 V is then fed to connector J20 (D3), pins 10-3, to power the operators control panel OFF lamp (LOFF).
By pressing the ON pushbutton, J20 connector pins 2-6 (D3) are issued with -24 V signal SETO and TL1 is energized through the open contacts 5-6 of relay RL4 (C3).
Main breaker TL1 is held-on with the closed contacts 6-7 of RL3 (C3) in turn fed with ONOF from pins 1-4 of connector J20.
ONOF, a -24 V signal, is supplied through the open contacts of the operators panel OFF pushbutton and those of interlock S01.
The RL3 relay is energized if the protection circuits have not been called upon.
When energized, TL1 supplies:

- Transformers T1 and T3
- Blowers H1 to H3
- The CON 271 elementary unit
- Elapsed time counter

- Delay relay RL5.

With the closure of the RL5 contacts (B4), relay RL4 (B4) is energized. Through the closed contacts 9-11 of this last mentioned relay, the +20 R voltage is derived from the +20 V. This delayed voltage is then fed to the P8-4 terminal board (B4).
Opening of the RL4 contacts 5-6, inhibits the energizing of main breaker TL1 when the operators control panel ON pushbutton is depressed,
The Power Supply is switched off through the de-energizing of TL1 whenever:

- The operators control panel OFF pushbutton is depressed
- The S01 interlock opens (rear handler door open)
- RL3 de-energizes (protection circuits have been called upon).

4.4.4.2 - +20 V Supply

Power Circuit

This circuit is composed of a T3 transformer secondary (D1) that, through bridge rectifier D7 to D12, furnishes a DC voltage filtered by capacitor C3. This voltage is set by the "series" transistors TR2 to TR5 (C4 - C5).
These transistors pratically form an emitter-follower having an emitter resistance composed of the Power Supply load. Resistors R14 to R17 bias the pertinent emitter to adapt the gain of the four transistors.
If the output voltage decreases, the error voltage, through TR6, causes to increase the conduction of TR2 to TR5 so as to bring the output to its nominal value.
If the output increases, the error voltage, again through TR6, causes transistors TR2 to TR5 to conduct less so as to bring the output voltage back to its nominal value once again.
Capacitor C6 (D7) further filters the voltage before it is fed to the Power Supply output terminals.

Comparator Amplifier Circuit

The comparator compares a portion of the output voltage, derived from the R13-RV2 and R12 divider, with a constant reference voltage obtained through Zener diode D35. This is accomplished by applying the first voltage to the base and the second to the emitter of TR10 which is supplied with -20 V.
With nominal output voltage (+20 V), the base of TR10 is negatively biased with respect to the emitter; the transistor therefore conducts and its collector issues a certain "error" voltage. Any output variations will be partially applied to the base of TR10 through the voltage divider.
If the output voltage increases, the base of the transistor goes to an even lower negative level causing an increase of collector current and consequently lowering the "error" voltage.

If the output decreases, the base of TR10 becomes less negative causing a collector current decrease and consequent rise of "error" voltage.
The amplifier is biased through capacitor C10 to avoid any ripple from being considered.
Error voltage and therefore the output level may be adjusted through pot RV2.
The output of amplifier TR10 is fed to emitter-follower TR11 to match the current requirements of the power circuit.

Current Limiter Circuit

This circuit senses the Power Supply output current through resistors R22-R23 (E2), series connected to the output. These resistors produce a voltage drop, directly proportional to the current, that in turn is applied to the base of TR13, which has load resistor R8 common to TR10.
During normal conditions (output current less than max. limit) TR13 is cut-off.
When the output current reaches the set level, the voltage drop on R22-R23 forces the base of TR13 to go negative with respect to the emitter, causing the transistor to conduct.
The lowering of the error voltage decreases the conduction of the series transistors while the decreasing output voltage maintains the current to the constant max set value. This level can be adjusted through pot RV4.

4.4.4.3 - -20 V Supply

Power Circuit

Composed of a T3 transformer secondary (B1) that, through bridge rectifier D1 to D6, furnishes a DC voltage filtered by capacitor C2 and set by TR1 (B4).
TR1 base current is set by emitter follower TR7 that is driven by the error comparator amplifier circuit.
If the output voltage decreases, the error voltage causes a heavier conduction of TR1 that brings the output voltage back to its nominal value.
If the output increases, the error voltage lowers the conduction of TR1 so as to bring the voltage to its nominal value once again.
Capacitor C5 (C7) further filters the voltage before it is fed to the Power Supply output terminals.

Comparator Amplifier Circuit

The comparator compares a portion of the output, derived from the R6 - RV1 and R5 divider (B5), with a constant reference voltage obtained through Zener diode D34. This is accomplished by applying the first of these voltages to the base and the second to the emitter of TR9 (B3). This transistor is supplied with a -30 V auxiliary voltage,which is drawn from a T3 transformer se

condary winding (A1) through the D31 to D33 bridge rectifier and filtered by capacitor C4 (A6).
With nominal output voltage (-20 V), the base of TR9 is negatively biased with respect to the emitter; the transistor therefore conducts and its collector issues an error voltage. Any output variations will be partially applied to the base of TR9 through the voltage divider.
If the output voltage increases, the base of the transistor goes to an even lower negative level causing an increase of collector current and consequently lowering the error voltage.
If the output decreases, the base of TR9 becomes less negative, causing a collector current decrease and consequent rise of error voltage.
The amplifier is biased through capacitor C11 so as to avoid ripple from being considered. The RV1 pot enables to adjust the error voltage and therefore the output level.The amplifier precedes emitter follower TR8 in order to supply the current necessary to drive the power circuit.

Current Limiter Circuit

This circuit senses the Power Supply output current through the R20 resistor (C3) which is series connected to the output. The voltage drop across the resistor, directly proportional to this current, is then applied to the base of TR12 (C4) which has load resistor R1 common to TR9. During normal running conditions (output current less than max limit) TR12 is cut-off.
When the output current reaches the set level, the voltage drop across R20 forces the base of TR12 to go negative with respect to the emitter, causing the transistor to conduct. The lowering of the error voltage decreases the conduction of the series transistor,while the decreasing output voltage maintains the current to the constant max set value. This level can be adjusted through pot RV3.

4.4.4.4 - -5.5 V Supply

This voltage is derived from the -20 V supply through Zener diode D36 (B7).

4.4.4.5 - +23 V Supply

The power circuit consists of a T3 transformer secondary (D2) which gives out a DC level of +23 V.
The transformer output goes through the D14, D16 and D18 rectifier bridge, with reference to the centre of the winding, and is then filtered with capacitor C9 (D4).

4.4.4.6 - -23 V Supply

The power circuit consists of a T3 transformer secondary (D2) which gives out a DC level of -23 V.
The transformer output goes through the D13, D15 and D17 rectifier bridge, with reference to the centre of the winding, and is then filtered with capacitor C8 (D4).

4.4.4.7 - +48 V Supply

The power circuit is composed of a T1 transformer secondary (A2) that, through the D25 to D30 bridge rectifier, supplies a +48 V DC voltage in turn filtered by capacitor C7 (A4).

4.4.4.8 - Phase Fall Protection

This circuit is composed of the D37 to D39 bridge rectifier (B6) supplied by the T3 secondary and D55 SCR rectifier (C6).
The bridge output feeds that end of the potential divider composed of R35 and R36 in parallel with R37. The other end of the potential divider receives +20V.
During nomal functioning conditions (all phases present) the bridge output takes on the values and waveform illustrated in Fig. 4.24..

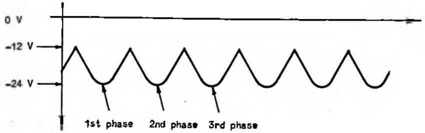

Fig. 4.24. - Bridge Rectifier Output Waveform (all phases present)

The instantaneous voltage never goes below -12 V therefore the dividers output will be held under the 0 V level.
If any one of the phases should fail, the bridge output will assume the waveform shown in Fig. 4.25..

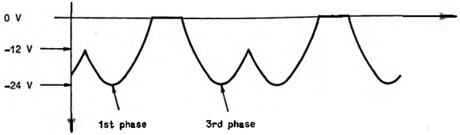

Fig. 4.25. - Bridge Rectifier Output Waveform (one phase missing)

When the instantaneous voltage goes to 0 V, the divider output assumes a positive level forcing the D55 SCR rectifier to conduct.
The D58 cathode voltage tends to zero; the Zener diode cuts-off consequently causing cut-off of TR14 and the de-energizing of RL3. The opening of RL3 contacts 6-7 (C3) remove the hold-on of main breaker TL1 (B3).

4.4.4.9 - Voltage Protection

This circuit is essentially comprised of a voltage divider the output-of which is applied to a level discriminating differential amplifier with on ON-OFF output.
One side of the divider is fed with the voltage to be protected while the other side receives a 10 V reference level of opposite sign.
The +10 and -10 V references are obtained through Zener diodes D59 and D60.
There are two distinct circuits, one for positive and one for negative variations. Both are mounted on PWB TECA81. See Dwg. n° 14453547.

Positive Variation Protection

This circuit is basically composed of 4 voltage dividers, ORed with diodes D47 to D50 (B7 - C7).
Amplifier TR9 (D6) and differential amplifier TR18 - TR15 (D5) are cascade connected. TR9 receives the feedback through capacitor C15.
With voltages at their nominal value, the ORed output positively biases the base of TR9 with respect to the emitter, forcing the transistor to conduct and hold saturated TR18. As the collector voltage is not sufficient to make Zener diode D56 conduct, TR15 is cut-off.

Whenever a voltage rises over the set limit, the ORed output value varies in order to bring TR19 to saturation. By cutting-off, the TR18 collector voltage rises causing Zener diode D56 to conduct, in turn saturating TR15. As Zener diode D58 (B5) cathode voltage tends to zero level, TR14 is cut-off. Relay RL3 de-energizes causing the Power Supply switch-off.
The -20 and +20 V working points can be adjusted through pots RV6 and RV7 respectively.

Negative Variation Protection

This circuit is basically composed of 4 voltage dividers, ORed with diodes D51 to D54 (D7). Amplifier TR22 (D6), differential amplifier TR21-TR20 and inverter TR16 (D5) are cascade connected. TR22 receives the feedback through capacitor C16.
With voltages at their nominal levels, the ORed output negatively biases the base of TR22 forcing the transistor to conduct and hold TR21 saturated. As the TR21 collector voltage is not sufficient to make Zener diode D57 conduct, both TR20 and TR16 are cut-off.
Whenever a voltage goes under the set level, the ORed output value varies bringing TR22 to saturation. By cutting-off, the TR21 collector voltage rises causing Zener diode D57 to conduct in turn saturating both TR20 and TR16. As Zener diode D58 (B5) tends to level zero, TR14 is cut-off. Relay RL3 de-energizes causing Power Supply switch-off.
The -20 and +20V working points can be adjusted through pots RV8 and RV9 respectively.

4.4.4.10.- Overtemperature Protection

The ALI 040 Power Supply thermally protects 6 of its components through thermoswitches. These components are:

Supply Transformers - T1-T2-T3

Each of which encorporate 3 series connected thermoswitches, one on each primary winding, that open their contacts whenever the temperature rises above 105°C.

+20 V Adjustment Circuit Transistors

These have thermoswitch Tm3 physically mounted on their heat sink.

Reel/Motor Command Circuit Transistors

These have thermoswitch Tm2 physically mounted on the TR29 to TR31 heat sink.

Capstan Motor Command Circuit Transistors

These have thermoswitch Tm1 physically fitted on the TR23 to TR25 heat sink.

All these thermoswitches, fitted on heat sinks, open whenever the temperature rises above 75°C.
The Supply transformer thermoswitches T3, T2 and T1 (D3) are series connected with Tm3, Tm2 and Tm1 (D4) that, with resistors R28 (B4) and R30 (C4), are part of the TR7 base divider (C5).
One side of this divider (R28) receives the +20 V while the other (T3) is fed with -24 V.
When all the thermoswitches are closed, the base of TR17 is negatively biased (voltage drop on D43) with respect to the emitter; the transistor is therefore cut-off. The collector voltage causes Zener diode D58 to conduct; TR14 saturates and holds RL3 energized (C4).
If a thermoswitch opens, the base of TR17 becomes positive and the transistor saturates; the collector voltage, by going to +1.4 V, cuts-off D58 which in turn causes TR14 to turn off. RL3 de-energizes and the Power Supply is switched off.
Furthermore ALER2 (E4) is grounded through R30 causing the OFF pushbuttons red lamp to light on the operators control panel (TAV 240). The OFF indicator remains lit until closure of the thermoswitch.

4.4.4.11 - Capstan Motor Command Circuit

These circuits, see chapter 2220, are formed by two power amplifier stages, one for FWD and one for REV drive. See Fig. 4.26.

Forward Drive

Composed of the TR24 - TR25 amplifier (D6), which is controlled through emitter follower TR23, this circuit is supplied with +23 V.
TR24 and TR25 constitute an emitter follower whose emitter resistance is formed by the motor winding. In order to adapt the gain of the two transistors, resistors R77 and R78 determine a feedback on the pertinent emitter.
Emitter follower TR23 is triggered by signal COFOR.

Reverse Drive

Composed of the TR27-TR28 amplifier (D6), which is in turn controlled by emitter follower TR26, this circuit is supplied with -23 V.
TR27 and TR28 constitute an emitter follower whose emitter load is formed by the motor winding. To adapt the gain of the two transistors, R78 and R79 determine a feedback on the pertinent emitter.
TR26 is triggered by signal COREV.

The capstan motor power supply is fed to the P7-11 (MOTOR) and P7-10 (LICO) terminals. Signal LICO, present on RV5, is used by the current limiter PWB POCA, see para. 4.5.5.,while signal MOTOR is the feedback to the POCA boards second amplifier stage.

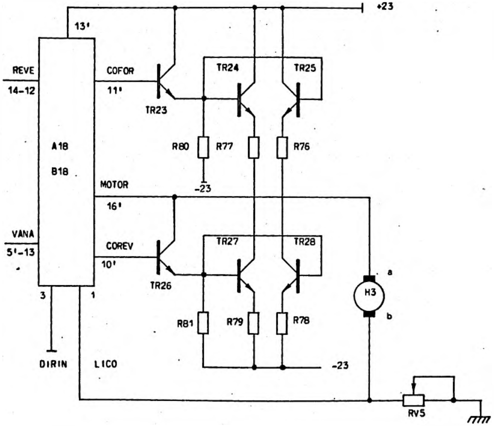

Fig. 4.26. - Capstan Motor Drive Circuit

4.4.4.12 - File Reel Motor Command Circuit

These circuits, see chapter 2220, are formed by two power amplifier stages, one for the CW and the other for the CCW rotation. See Fig. 4.27.

Clockwise Rotation

This circuit is composed of the TR36-TR37 amplifier, controlled through emitter follower TR35 (B6).
TR36 and TR37 constitute an inverter whose collector resistance is formed by both the CW field and rotor windings.
In order to adapt the gain of the two transistors, R102 and R103 determine a feedback on the pertinent base.
Emitter follower TR35 is triggered by signal PIBI.

Counter Clockwise Rotation

This circuit is composed of the TR39-TR40 amplifier, controlled through emitter follower TR38 (C6). TR39 and TR40 constitute an inverter whose collector resistance is formed by both the CCW field and rotor windings.
Resistors R104 and R105 cause a feedback on the pertinent base in order to adapt the gain of the two transistors.
Signal PIBO triggers emitter follower TR38.

The reel motor power supply is fed to the P7-6 (CW2), P7-4 (CCW2) and P7-5 (CO) terminals.

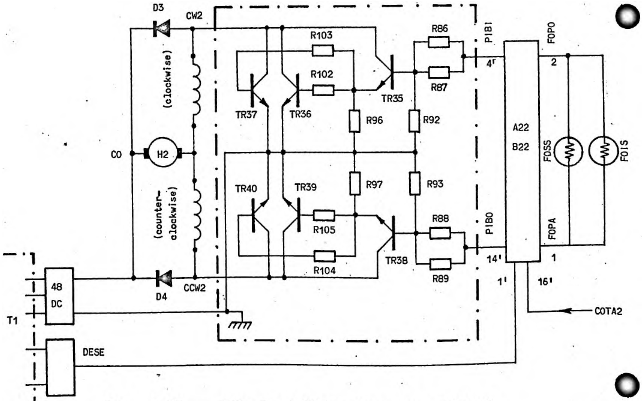

Fig. 4.27. – File Reel Motor Command Circuit

4.4.4.13 - Machine Reel Motor Command Circuit

These circuits, see chapter 2220, are formed by two power amplifier stages, one for the CW and one for the CCW rotation. See Fig. 4.28..

Clockwise Rotation

This circuit is composed of the TR30-TR31 amplifier (A5), controlled through emitter follower TR29.
TR30-TR31 constitute an inverter whose collector resistance is formed by both the CW field and rotor windings.
Resistors R98 and R99 cause a feedback on the pertinent base to adapt the gain of the two transistors.
TR29 is triggered by signal PIBE.

Counter Clockwise Rotation

This circuit is composed of the TR33-TR34 amplifier (B5), controlled through emitter follower TR32. TR33 and TR34 constitute an inverter whose collector resistance is formed by both the CCW field and rotor windings.
Resistors R100 and R101 cause a feedback on the pertinent base to adapt the gain of the two transistors.
Emitter follower TR32 is triggered by signal PIBA.

The reel motor power supply is fed to the P7-9 (CW1), P7-7 (CCW1) and P7-8 (CO) terminals.

4.4.4.14 - Service Relays

The ALI 040 is fitted with two service relays, see chapter 2219, RL1 and RL2 (D1) that energize upon loading conditions with REMA at "0".

RL1 Relay

When de-energized, enables to supply the reel brake solenoids with -24 V (FR1), through contacts 5-6 (C2), when no bin vacuum is present and when the upper bin cover is open.
When energized, enables to supply the reel brake solenoids with -24 V (FR2), through contacts 5-7, whenever vacuum is present in the bins and the upper bin cover is closed.
Furthermore, when energized, forces MALE to "0" through contacts 9-11.

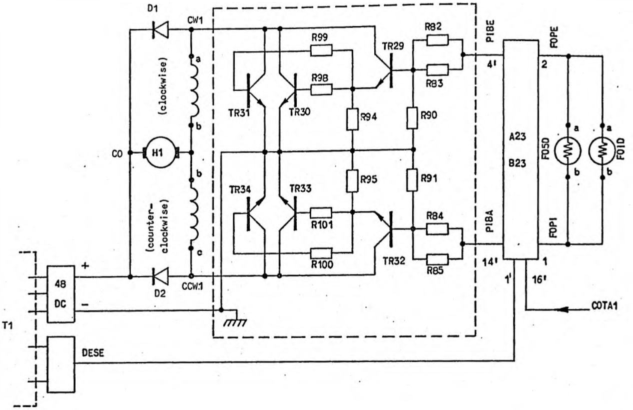

Fig. 4.28. – Machine Reel Motor Command Circuit

RL2 Relay

When energized, enables to supply the Inhibit Write relay, through contacts 9-11. During routine adjustments of this relay, contacts 9-11 are shunted by the closure of switch PS1 fitted on the Power Supply console.
Furthermore, enables to AC supply the vacuum motor through contacts 6-7.
See chatper 2220 (C2).

4.4.4.15 – AC Voltages

The ALI 040, see chapter 2220, provides two auxiliary voltages, precisely 97 and 20 V.
The 97 V, that supplies the vacuum motor, is derived from the primary winding of transformer T1 (A2) while the 20 V from one of its secondaries (B2).
This last voltage supplies the bridge rectifier of the circuit that generates sawtooth signal DESE. See PWB SELA, para. 4.5.8..

4.5. - SPECIAL BOARDS

4.5.1. - PATO : Tachometric Amplifier

General

The board (Dwg. n° 22943884) is physically mounted on the capstan motor itself and amplifies the phototransistors output signal.

Circuit Description

The PATO board consists of an integrated circuit operating as a high gain, open loop signal amplifier.
Pins 1 and 2 are the inputs while pin 3 is the output.
The output signal symmetry is set with pot RV1.
Resistors R8 and R9 are in series to the optical tachometer lamp.

4.5.2. - UNAP : Precision One-Shot

General

The board (Dwg. n° 01543372) furnishes a signal of duration inversely proportional to the capstan motor speed.
If the capstan goes beyond its rated speed, in other words if the tachometer output signal has a period smaller than the internal up-time of one-shot UNAP, the output will be held at 0 V.

Circuit Description

The input signal is fed, directly coupled, to the bases of TR1 and TR4.
With a 0 V input TR1 is cut-off while TR2, in saturation, holds TR3 cut-off.
The collector potential on TR3 is insufficient to make Zener diode D3 conduct, consequently TR4 is cut-off and the output on pin 4 goes to +6 V.
With a positive tachometer pulse, transistors TR1 and TR4 saturate and the output goes to 0 V. Capacitor C1, by rapidly discharging on TR1, cuts off TR2.
TR2 collector voltage rises and applied to the base of TR3, through diode D2, forces TR3 to conduct. As R8 is common to both emitter follower TR2 and TR3, the resulting feedback will speed up the switching time of the two transistors.
When TR3 reaches saturation, the emitter potential assumes such a level to cause the D3 Zener to conduct.
As the input goes to zero, TR1 cuts-off while TR4 remains in saturation, because its base is positively biased by D3.

Capacitor C1 charges with a CR time given by C1 (RV1 + R5), and when the charge potential is above that of the emitter of TR2, the said transistor starts conducting. As a consequence the voltage on the collector of TR2 decreases, cutting off TR3.
The voltage on the TR3 emitter goes below the D3 conduction limit consequently the base of TR4 tends towards zero and the transistor blocks.
The internal time of the one-shot, and therefore the capstan motor speed, can be adjusted through pot RV1.

4.5.3. - TARA : Signal Squarer

General

This board has the essential purpose of squaring-up and amplifying the PATO signal to a standard level.
The board (Dwg. n° 01543410) also mounts the following auxiliary circuits:

- Two calibration resistances
- Two burned EOT, BOT and tachometer lamp sensors
- COTA1 signal generator
- COTA2 signal generator.

Circuit Description

The input signal is AC coupled, with capacitor C1, to the TR2 base divider network which, under no signal conditions, keeps the transistor in saturation and TR3 cut off.
Under the said conditions, the potential on the collector of TR3 reaches a level that causes the conduction of Zener D2, biasing the base of TR1 so as to keep TR3 under saturated conditions and have the output at 0 V.
When, with a negative going edge, the input signal intersects the zero point, TR2 begins to come out of the saturated condition causing TR3 to start conducting. The feedback caused by R14 - C2 speeds up the TR2 cut-off.
The potential on the collector of TR3 goes lower than the level required by Zener D2 to conduct, causing the base of TR1 to go towards zero and cutting the transistor off.
The output will therefore assume a value comprised between +15 and +18 V.
As the input signal, with a positive going edge, intersects point zero, TR2 saturates, consequently TR1 also goes in saturation bringing the output to 0 V.
When +5 V is applied to pin 12, the output is inhibited. This condition is utilized during the Start Stop phases.

Auxiliary Circuits

Resistors R1 and R2 are utilized as calibrators. The photosensor and tachometer lamps are supplied with -5 V and grounded through diodes D4 and D1.
If the filament of one of the lamps goes in open circuit, the output voltage on either of its pins, 2 or 5, goes from 0 V to a level comprised from +7 to +10 V.

The circuit generating signal COTA1, that enables the machine reel, is basically comprised of transistor TR4 which is practically the NOR of signals MALE1 and VASA1.
COTA1 goes to "1" when MALE1 and VASA1 go to "0". This condition is given by the energizing of RL1 and closure of reference interlock S1.

The circuit generating signal COTA2, that enables the file reel, is basically comprised of transistor TR5 which is practically the NOR of signals MALE1, VASA1 and POSI1.
COTA2 goes to "1" when MALE1, VASA1 and POSI1 go to "0". This condition is given by the energizing of RL1, closure of reference interlock S1 and Out-of-Service interlock S3.

4.5.4. - INTO : Integrator

General

The purpose of this board (Dwg. nº 01543407) is to convert a variable duration pulse into an analogic signal, the amplitude of which must result proportional to the duration of the input signal.
The circuit utilizes the constant current charge of a capacitor which is initially discharged at the arrival of the command signal and undergoes charge throughout the duration of the signal.
The board has two sections, a negative one for FWD drive and a positive section for REV drive.

Circuit Description

With a 0 V input on pin 12, transistors TR3 and TR4 are cut off and no charge current is available for capacitor C6. TR1 is cut off while TR2 is in saturation, keeping TR5 cut off through D6.
Let us assume that C6 be still charged with a previous circuit action. When the pulse generated by PWB UNAP is applied to the input, TR3 saturates causing TR4 to become a constant current generator looped around C6 and TR5.
Simultaneously TR1 goes in saturation, rapidly discharging capacitor C1 that causes TR2 to be cut-off. TR2 collector voltage rises and through D6 will saturate TR5, that in turn discharges C6. Under these conditions, the output on pin 14 remains at 0 V throughout the discharge time of C1.

When C1 has discharged, TR2 goes back to saturation,cutting off TR5 and causing C6 to start its charge path. C6 continues to charge until TR4 cuts off, in other words for the entire duration of the command pulse.
The enabling pulse for the reverse drive mode is applied to the sections pin 2. The negative section, forward mode, has a similar function having the input on pin 5' and enabling pulse on pin 1.
Fig. 4.29. illustrates the relative input and output signal waveforms.

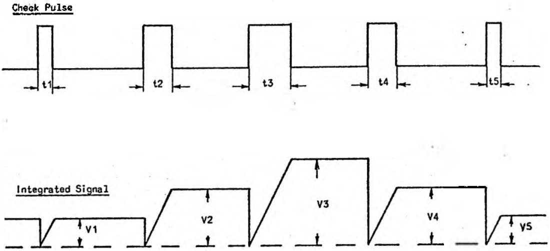

Fig. 4.29. - INTO Input and Output Signals

4.5.5. - POCA : Capstan Preamplifier

General

This board, see Dwg. n°· 01543451, has the purpose of amplifying the signal generated by board INTO, to pilot the capstan motor power circuits.
It consists of a high gain amplifier with a high impedance input.
It also includes a current limiter to automatically out-in on Start and Stop command pulses so as to shape them with linear leading and trailing edges.
A rewind speed fine adjust circuit is also incorporated.

Circuit Description

The POCA board is composed of two series connected integrated circuit amplifiers. The output is fed to emitter follower TR3 and inverter TR2, that respectively control the FWD and REV motor power circuits.
The two INTO signals are fed to pins 12 and 13 of this board.
The -14 V for FWD drive is applied to pin 12 while the +14 V for REV mode is applied to pin 13.

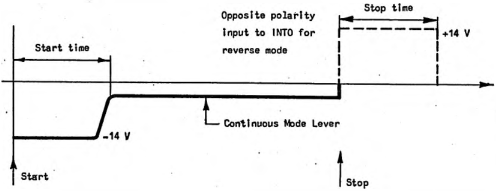

Fig. 4.30. - Forward Mode Waveform

Present on pin 16' is signal MOTOR which, having undergone a 1.2 amplification with respect to the board input signal, is the feedback to the second amplifier.

Because of the current limiter, during Start/Stop commands, the waveform on pin 16' will be as shown in Fig. 4.31..

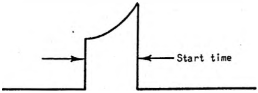

Fig. 4.31. - Current Limiter Output Signal

The motor current is held constant by linearly increasing the voltage so as to compensate the motors back emf. The circuit that accomplishes this function is the current limiter, illustrated in Fig. 4.32..

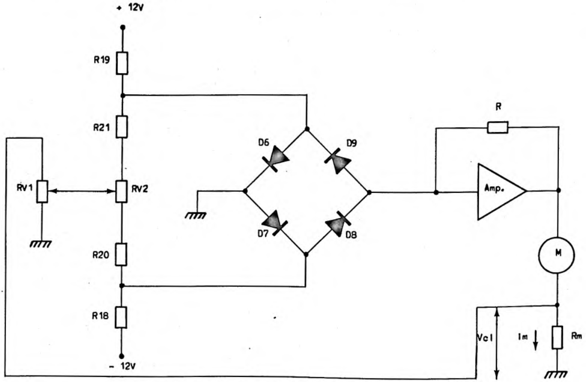

Fig. 4.32. - Current Limiter

The circuit, whose feedback voltage is proportional to the motor current, only functions during the Start/Stop phases; infact it is automatically cut out during the continuous mode operation.
The R19, R21, RV2, R20, R18 divider and the D6 to D9 bridge rectifier,furnish a positive and negative dead zone which will never result less than the Vcl voltage when the motor is at rated speed (low current, therefore the Vcl will also be very small - Vcl = I x Rm).
Both the negative and positive dead zones and the gain of the two drive senses can be balanced through pot RV2, while the start time can be adjusted by varying the Vcl, at the circuits input, through pot RV1.
Pot RV3 varies the gain of the first amplifier to balance the motor speed in both drive senses. The circuit that brings the motor to the high rewind speed of 300"/sec is composed of transistor TR1.
During normal conditions, pin 3 is fed with signal 01RIN at "1" thus saturating TR1. Upon a Rewind command, 01RIN goes to "0", TR1 cuts off making a charge path for C1 and C3. The charge voltage is limited, by diode D1, to the value given by divider R5 and R7.
This voltage is also applied to the second amplifying stage and enables to drive the capstan motor at the rewind speed of 300"/sec. The rewind speed can be adjusted through pot RV4.

4.5.6. - SEBO : Reel Preamplifier

General

This preamplifier converts the light variations produced by tape loop movement within the bins and sensed by the photoresistors, to a control voltage used to drive the motor power circuits.
The board is composed of a current amplifying stage, a differential amplifier, two gate circuits and two final inverters. See Dwg. n° 01543409.

Circuit Description

With the tape in the mid bin position, the output on the collector of TR1 will be the same as the comparison voltage on the base of TR3. Under these conditions the differential amplifier, TR2-TR3, is balanced. The comparison voltage can be adjusted through pot RV2 (dead zone adjustment).
The output of the differential amplifier is summed to the saw-tooth signal present on pin "1". As gate circuits TR6 and TR8 only conduct for a very brief portion of the saw-tooth signal, outputs 4' and 14' will provide pulses ranging from 0 V to +14 V used to drive the motor in both rotating directions.
The frequency of the pulses is 100 Hz and their duration may be adjusted with RV2.
If the tape moves upwards in the bins, the photoresistors are hit with great

er light, thus causing an increase in the current flow through amplifier TR1. The base of TR2 therefore goes negative with respect to the base of TR3. The rise of the TR2 collector voltage enables the saw-tooth signal to hold TR6 conducting for a longer period. The TR3 collector voltage in turn falls to a level that, summed to that of the saw-tooth voltage, will not result greater than the D2 Zener diode threshold. This results with an output of 0 V on pin 14', while pin 4' is issued with pulses that drive the motor power circuits so as to obtain a new balanced condition. Pin 16' receives signal COTA that at 0 V inhibits the gate amplifiers.
The current amplifiers gain can be adjusted through pot RV1.

4.5.7. - AMFO : Photoelectric Amplifier

General

This board, see Dwg. n° 01543386, amplifies those signals coming from the photosense group so as to indicate the presence of the BOT and EOT reflective strips.
The board is divided into two sections, each composed of an high gain amplifier and an ON-OFF stage.

Circuit Description

When no reflective strips are present, both sections of the board are at 0 V. TR1 and TR3 conduct, but the voltage on the emitter of TR3 is not sufficient to make Zener diode D1 conduct. Under these conditions, TR5 is cut-off and TR7 is in saturation. Exactly the same thing occurs on the other section.
When on the other hand the EOT marker is sensed, the TR1 base voltage becomes less positive, consequently the emitter voltage of TR3 will rise until D1 conducts. TR5 saturates cutting off TR7 and the output goes to +6 V.

4.5.8. - SELA : Bin Lamp Control

General

The purpose of board SELA (Dwg. n° 01543416) is to guarantee a constant light emission and compensate for ageing and inertia at switch-on.
The board also mounts a sawtooth generator used by PWB SEBO.

Circuit Description

The control photodiode COLA, connected across pins 1 and 2, senses bin lamp light emission variations by altering its current flow.
Diode conduction changes are amplified by the TR4 - TR5 high gain amplifier, set-up, then fed to emitter-follower TR3.
R8 and C1 give feedback to the amplifier.
The TR3 output is fed to inverter TR2 that in turn drives emitter follower TR1. Output pins 4 and 5 are respectively connected to the base and collector of the series transistor that drives the Bodine oscillator.
The supply to this oscillator can be preset through pot RV1 to guarantee a sufficient brightness level for proper reel motor operation.
If lamp brightness decreases, COLA also conducts less and the base of TR4 becomes less negative. The TR4-TR5 amplifier output voltage consequently becomes more negative. This level is then applied to the base of TR2, through TR3.
The TR2 collector voltage, by becoming less negative, increases the conduction of TR1 and consequently that of the series transistor.
These conditionsincrease the oscillators supply in order to re-establish lamp brightness.
In case of lamp failure or if PWB SELA is no longer in the condition to control its brightness, because the series transistor is in saturation, the TR3 emitter voltage reaches a value sufficient to make Zener diode D1 conduct.
TR7 cuts-off and the output goes to +6 V, signal SILA.

The saw-tooth signal generator comprises a rectifying bridge D4 to D7 and transistor TR6 that discharges and charges capacitor C6.
The bridge is supplied with a 20 VAC 50 or 60 Hz voltage and gives a negative pulsed output having a frequency double that of the mains.
During the negative half wave, the transistor is cut-off and C6 is charged.
When the half wave intersects level zero, TR6 saturates and rapidly discharges C6.
The output signal, present on board pin 14, will be a 100 or 120 Hz saw-tooth signal, at a level ranging from +2.5 to 4.5 V.

4.5.9. - PAMI : Read Preamplifier

General

This amplifier, see Dwg. n. 01543401, has the purpose of amplifying the read heads analogic signals. The output can be pot adjusted.

Circuit Description

The circuit is a double stage linear amplifier, consisting of two cascade connected transistors TR1 and TR3.
The correct magnetic head load is given by resistor R1 which is parallel connected with the first stage input impedence. The first stage amplifies the input 12 times through TR1. The input to the second stage is pot adjusted with P1.
Bias voltage for the second stage is given by Zener diode D1, developed across pot P1 and emitter follower TR2. To lower the output impedance, the final amplified voltage is fed through a further emitter follower TR4. The second stage gives a gain of 18, bringing the circuits total max gain to roughly 220 times the input signal.

4.5.10. - PARI A0 and PARI A1 : Realignment Circuit

General

This circuit, see Dwg. n° 01543433 - 01543432, longitudinally realigns the various track signals. It has two distinct amplifying channels, one for FWD and one for REV mode.
The output signal amplitude may be adjusted through two pots.

Circuit Description

The PAMI PWB signal is applied to the input of the delay line which is in turn driven and terminated with its characteristic impedance.
The 10 us delay on the PARI A0, is obtained by connecting in series two 5 us delay lines, while the PARI A1 delay of 5 us, is obtained with a single delay line.
To compensate the attenuation that the delay line resistance introduces,which will therefore vary according to the chosen delay, both the FWD and REV channels can be appropriately adjusted through the P1-R5 and P2-R6 dividers, respectively.
The signal present on the adjustment sliders of P1 and P2, is applied to the base of amplifiers TR1 and TR2 which share a common output.
Of these two amplifiers, only one will be called upon through the FWD and REV selection circuit which is composed of transistors TR3 and TR4.
Resistor R5, physically mounted on PWB TRAL, forms the TR1 and TR2 amplifiers load resistance.

4.5.11. - TRAL : Transmitter

General

This power transmitter, see Dwg. nº 01543399, drives the MTC/MTH connecting cable.

Circuit Description

The board fulfills two functions:

a - Density Selection and Amplification: TR1 - TR2 - TR3

Linear amplifier TR1 is only operative when phase modulation (PM) is selected through TR2. Its purpose is to adapt the preamplifiers output signal to the level required by the interface.
The use of resistor R5, across pin 7, is twofold:

- Load for TR1
- Load for PARI PWB, when the NRZI option is fitted.

Consequently, three amplifiers share the same load resistor but only one is selected at a time. The output of the pertinent amplifier goes to the next stage and to the Field Tester through emitter follower TR3.

b - Impedance Matcher and Output Selector: TR4-TR5-TR6-TR7

The signal generated by TR3 is fed through two successive emitter followers, TR4 and TR7, the purpose of which is to match the output to an impedance of a few ohms.
Transistors TR4 (PNP) and TR7 (NPN) compensate any voltage drops and thermal variations while resistances on the collector of TR7 act as limiters.
The transmission line is made up of a twisted pair, one line for the signals the other for ground return. The output line goes from the emitter of TR7 while the return from the collector of TR6. This last mentioned transistor functions in ON-OFF. When in saturation, it closes the line loop; when cut-off, with the simultaneous saturation of TR5, isolates the line.

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COPIE A 2 70

IND. REV.

1. GENERAL CHARACTERISTICS

1.1. Foreword

This magnetic tape controller allows the connection of seven and nine tracks "single capstan" tape handlers to the 100 series systems.

1.2. General

1.2.1. Performances

The recording method is the one of "Phase Modulation" (P.M.)
Optionally, it may also be "No return to zero" (NRZ1).
The possible tape movement speeds are 18,75 "/sec, 37,5"/sec, 75"/sec.
Tapes with seven tracks and 200, 556, 800 b.p.i. (NRZ1) density and nine tracks tapes with 800 b.p.i. (NRZ1), 1600 b.p.i. (P.M.) density may be used.

1.2.2. Compatibility

The format of the tapes is compatible with the one of the Standard systems Series 7221, , 7330, 2400 7 tracks NRZ1, Series 2400 9tracks PM and NRZ1 and ASA 7/9 tracks.
The Software is compatible with the GUN 7/9, with the difference that the clear sets 1600 instead of 800 b.p.i. density.
The controller is compatible with the GE 115/1, GE [illegible], GE 115/2 and GE 130.

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1.3. Physical configuration

The MTC physical unit, as given in drawing 15023601, consists mainly of the basic controller for P.M. (GUN 170), sited in a cabinet (CON 330) and provided with a ventilation group (VAR 332).
The option for the NRZ1 (GUN 171) performance and the completions for the adjustements to the various speeds may be added on the controller itself.
In the same cabinet there is also the A.C. distribution panel (ALI 260).
The physical unit has, on connectors J3, J4, J5, the interface towards CPU and, on connectors J12, J14, J16, the interface towards the tape units.
It presents in addition other terminals as indicated by the drawing n° 15024607.

1.4. Electric configuration

1.4.1. Logic connections

The physical unit is connected to the system with three cables having a maximun length of 8 meters, which start from J3, J4, J5.

Three cables start from J12, J14, J16 to connect the first Tape handler.
The connection between the base and the option is done by means of two connectors (J1/J2 and Y1/Y2) assembled on the two parts, and which are face to face at the moment of the assembly.

1.4.2. D.C. voltages

The controller requires only one d.c. voltage, taken from the central power supply of the system to which it is connected.
The value of the voltage must be +20V ± 5%, with the possibility of variations of ± 10% for the margin evaluation operation.
The absorption is 24.4 A with a nominal voltage of +20V.
Therefore the absorbed power is 0,5 KW (0,4 KW without option).

1.4.3. A.C. voltage

The physical unit requires a three-phase power supply 220 V - 50Hz or 208V - 60Hz, taken from the ventilation group system. The absorption is 0.5A.
In addition, it receives the power supply to be sent to the tape handlers

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1.5. Mechanic configuration

The mechanics consists of a cabinet with sizes 1680 x 985 700 mm, with two doors hinged to the left 882 mm. wide (drawing no. 15043 604).
The controller, consisting of four electronics modules, is located in the front part. The options, consisting of another electronics module, may be fixed on it.
The ventilation group, on which the filters are fixed, is inserted, like a drawer, underneath the above mentioned groups.
On the back, on a removable support, there is the A.C. distribution panel.
The weight of the physical unit is 210 Kg.
The physical unit is provided with four wheels for movement and with adjustable foots for when it is on place.
At the base of the cabinet, there is the cable duct and a recovery pit.

2. REQUIRED ENVIRONMENT CONDITIONS

2.1. Operating conditions

The temperature limits are °C equal to °F with a variation not above °C (°F) per hour.
The humidity limits are - %.
Atmospheric pressure.
Floor vibrations g at - Hz.
The dissipated heat is 420 Cal/h (345 Cal/h without the option).

Note: the variation speed of the temperature and humidity must be such not to cause humidity condensing on the equipment.

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2.2. Storage and transport conditions

Temperature

Humidity

Note: the variation speed of the temperature and humidity must be such not to cause humidity condensing on the equipment.

3. OPTIONS LIST

The MTC physical unit provides for an option to be added to the GUN 170, whose name is GUN 171.
This option is used for the NRZ1 operation.
Each one of the two above mentioned elementary units needs a completion for the adjustement to the various tape training speeds, as it may be seen from the table or on the drawings 15023601 and 15023605.

Tape handler speed		18.75 ips		37.5 ips		75 ips	
Elementary Unit	Description	P.M.	P.M. + NRZ1	P.M.	P.M. + NRZ1	P.M.	P.M. + NRZ1
GUN 170	Basic controller	1	1	1	1	1	1
GUN 171	NRZ1 option		1		1		1
GUN 172	Completion for P.M.	1	1				
GUN 174	Completion for P.M.			1	1		
GUN 178	Completion for P.M.					1	1
GUN 173	Completion for NRZ1		1				
GUN 175	Completion for NRZ1				1		
GUN 179	Completion for NRZ1						1
	Physical unit MTC	163	164	166	167	172	173

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4.0. GENERAL PROGRAMMING CHARACTERISTICS

4.0.1. Recording method

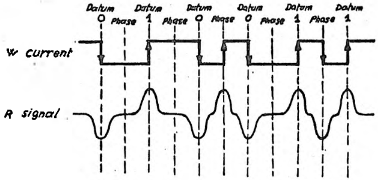
4.0.1.1. Phase modulation

With the basic controller the recording is done with the phase modulation (P.M.) method, which allows a packing of 1600 b.p.i.

This method consists of causing a variation in the magnetic status of the tape in correspondence with every datum both if it is "1" or "0".

The distinction is given by the sense of the variation.

When two equal data must be recorded, a service variation is introduced between the two, "rigenerating the phase", i.e. it sets the magnetic flow in order to record the datum with the correct sense.



For further details refer to specifications.

4.0.1.2. No return to zero

With the option, it is possible to record also with packings of 200, 556, 800 b.p.i.

The method consists of causing a variation in the magnetic status of the tape in correspondence of every bit "1" only and of the absence of variations for the bits "0".

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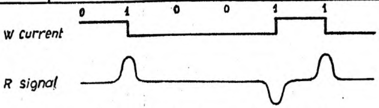

For further details refer to specifications.

4.0.1.3. Tape erasing

The erasing consists of an uniform magnetization of the tape.

4.0.2. Tracks

The bits of every character are recorded on parallel tracks set along the tape.
For the PM, the tracks are nine and a misalignment of the bits of the same character is allowed, which though must be below four recording periods.
For the NRZ1 the tracks may be seven or nine and a misalignment of half recording period is allowed.

4.0.3. Density

In PM, the density is 1600 bits per inch.
In the NRZ1 with nine tracks only the 800 b.p.i. density is allowed, while with the seven tracks the 200, 556, 800 b.p.i. is densities are possible.

4.0.4. Medium beginning and end

The tapes must be provided with two relecting strips indicating the beginning and the end of the medium.
In addition, the PM tapes will begin with a special block consisting of 1600 bits per inch, on track 4 (MIFU).
Such a block starts 1.7 in before the final limit of the spot of beginning of tape and continues for additional 0.7. in,
After the "Burst" recording there is an erasing for 4.5".
After the reflecting strip of medium end it is possible to record for a length of 25 in.

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4.0.5. Bit-track correspondence

For the seven tracks tapes it is:

Track	1	2	3	4	5	6	7
Bit	2^0	2^1	2^2	2^3	2^4	2^5	P

For the nine tracks tapes it is:

Track	1	2	3	4	5	6	7	8	9
Bit	2^2	2^0	2^4	P	2^5	2^6	2^7	2^1	2^3

4.0.6. Blocks

The information are organized in blocks.

4.0.6.1. P.M. Blocks

In P.M. the information are preceded by a "pre-amble" consisting of forty characters all with bits "0" followed by a character all with bits "1". The block ends with a "post-amble" consisting of a character all with bits "1" followed by forty characters all with bits "0".
Between two subsequent blocks there is an interval equal to 0.6 nominal inches.

4.0.6.2. NRZ1 Blocks

In NRZ1 the block starts with the information and ends with the character LRC if with seven tracks; while with nine tracks it ends with the character CRC followed by LRC.
The interval between two nine tracks blocks is of 0.6" while at seven tracks is of 0.75" (nominal values).
The blocks must have a minimun length of 18 characters, CRC and LRC excepted. Blocks of 1 character, besides the "tape marks, are allowed.

4.0.7. Vertical check - VRC

On nine tracks tapes, both in PM and NRZ1, the vertical check is an odd parity check.
On seven track tapes, the check may be both an even and odd parity check.

4.0.8. Longitudinal check - LRC

Only in NRZ1, this is a character to be recorded at the end of every block, in such a way so that the variations on every track are an even number. This character is located at a nominal distance of four periods from the last datum of the block in the seven tracks tapes; and at four periods from the CRC in the nine tracks tapes.

4.0.9. Cyclic redundancy character - CRC

On the tapes NRZ1 - nine tracks after the last character of the data block, at a nominal distance of 4 periods, there is a cyclic redundancy character (CRC).
This character allows the check and the self-correction of special types of errors.

4.0.10. Unitary blocks

They are blocks of a single datum, no matter which one.
In NRZ1 the unitary block is followed by the character LRC.
At nine tracks, the CRC has all the bits at "0" if the block was created with the command "Record unitary block".

4.0.11. Tape mark.

It is a special unitary block.

4.0.11.1. T.M. in PM

It consists of a block without pre-amble, with transitions at 3200 b.p.i. on tracks 2,5,8 (AIFU, BIFU, FIFU) and no transitions on tracks 3,6,9 (DIFU, EIFU, GIFU).
The TM must be recorded with the instruction "record unitary block".
In reading, the binary character 19 is sent to the central processor.

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4.0.11.2. T.M. in NRZ1 - 7 tracks

In NRZ1 - 7 tracks it is alway recorded with parity check. Its configuration is the following:

Track	1 2 3 4 5 6 7
T.M.	1 1 1 1 0 0 0

which corresponds in the Machine code (8 + 1) to the 79 binary and is always recorded with parity check.

4.0.11.3. T.M. in NRZ1 - 9 tracks

With nine tracks, it consists of recording the character 19 (binary), witout the CRC, i.e. by means of the instruction "record unitary block".

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4.1. Commands description

The controller recognizes and controls the performance of the following commands, received from central processor and transmitted to one of the connected tape handlers.

4.1.1. Commands who make the controller busy

	Binary Code	Hexadeciaml Code
Read forward	64	4/0
Read reverse	65	4/1
Recording	66	4/2
Unitary block recording	67	4/3
Read forward with self-correction	72	4/8
Read reverse with self-correction	73	4/9
Erasing	74	4/A
Forward back space	175	A/F
Reverse back space	13	0/D

4.1.2. Commands out occuping the controller

Rewind	68	4/4
Rewind and unload	12	0/C
Set FM	173	A/D
Set high NRZ1 densities	163	A/3
Set medium NRZ1 densities	164	A/4
Set low NRZ1 densities	165	A/5
Even parity	166	A/6
Odd parity	167	A/7
Seven wais	172	A/C
Channel change	174	A/E

4.1.3. Specific commands of diagnostic hardware

Count	224	E/0
Clear	240	F/0
Perform	248	F/8

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4.1.4. NOOP

In addition, the command NOOP (71 binary-4/7 hexadecimal) is accepted without performing any operation.

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4.2. Description of the program limits

The controller presents some "automatic" type program limits, i.e. some hardware protections which intervene when certain conditions occur.

There are, in addition, some non automatic limits, that the software must take into account.

4.2.1. Stop- Start

It is imposed by the characteristics of the tape handler, so that from the moment in which the stop phase starts, the tape cannot run again before 4.5 msec. have elapsed for the MTH 166/172 and before 3.5 msec. for the MTH 163.

4.2.2. Continuous commands

The commands, occupying the controller, may be repeated, without stopping the tape, at the only condition that the direction the tape and the interested unit are the same, and that the command itself arrives within a certain time from the moment in which the controller is freed. This time is equal to the period of USTO (see para 6.2.5.4.7.).

4.2.3. Clear

This signal, in any moment, sets the tape handlers in odd parity and at their highest possible density.

4.2.4. Program loading

It is possible to load programs from tapes.

On units set both for PM and NRZ1, tapes recorded in both ways may be loaded; in NRZ1 the density must be 800 b.p.i.

4.2.5. EGOL - NU10

In the instructions to read in PM it is possible to send to the Central Processor, after the data block, other characters up to a maximun of forty-five.

This sistuation, signaled by EGOL, occurs when there is a self-correction and the post-amble is transferred, at least in part.

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Therefore a research backward for the post-amble key, i.e. of the character with all "1" must be done to eliminate the additional characters.
Should NU10 be also present, the research mentioned above, must take place neglecting the last four characters transferred, as, among then, there is a character with all "1 " which does not correspond to the beginning of the post-amble.

4.2.6. Recording at the beginning of tape

With the tape positioned on the beginning spot, it is necessary to perform at least one erasing command before recording the first block.

4.2.7. End of tape recording

After the end of tape spot, it is allowed to continue to record for 25 in.

4.2.8. Density - Parity

The density and the parity, with which to work may be defined only if the tape is positioned on the beginning spot.

4.2.9. Read forward - Recording

On the same tape, the command "Read forward" (or read forward with self-correction of forward back space) may be followed by the command "recording" (or unitary) block recording or erasing) only if the block to be read:

a) is not the last one an already recorded series,
b) at the moment of its recording has been followed by an erasing.

4.2.10. Read reverse - Recording

It is not allowed that, on the same tape, the command "read reverse" (or read with self-correction) be followed by the command "recording" (or unitary block recording or erasing). The sequence "reverse back space" "erasing" is instead allowed.

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4.2.11. Recording - Read Forward

The performance of "Read forward" (or read forward with self-correction or forward back-space on possible blocks after the recording itself is not allowed after a "recording" command (or unitary block recording or erasing).

4.2.12. Back space

After a command of "forward back-space , it is allowed to perform, on the same tape, only the commands implying a reverse movement of the tape itself. The same thing occurs for the reverse back-spaces with the exception of the command "Recording" and "Unitary Block recording".

4.2.13. Tape Mark

The tape mark recordings must imply the sending of one character only from C.P.U.

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4.3. **Status Information**

The controller presents these signals on the 100 interface. They have logic meaning "1" when their level is at 0 volts.

4.3.1. **MAPET**

It indicates that the selected tape handler ready.

4.3.2. **PEOOT**

It indicates that the controller is free and the selected tape handler is ready.

4.3.3. **SECOT - MARET**

They indicate that the unit is not available or that several units have been selected simulatneously or no unit has been selected.

4.3.4. **TESET**

It allows the signal of end of tape detected by the selected unit.

4.3.5. **IGOLT**

It indicates that the selected unit is inhibited at the recording.

4.3.6. **MATET**

It indicates that a self-correction has occurred during the reading of the last block. In NRZ1 the signal is not given if the block has proved to be incorrectable.

4.3.7. **EGOLT**

It indicates that the post-amble has been transferred at least in part.

4.3.8. **NU1OT**

It indicates that, besides the post-amble, also an "all 1 " character has been transferred at the end.

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4.3.9. **FISET**

It indicates that a unitary block (tape mark) has been recognized.

4.3.10. **ERCAT**

It signals that the command received or the datum sent or received, has a wrong odd parity check (EG00).
In addition, it indicates that during trigger exchange, a synchronism error has occurred (ESIN).

4.3.11. **CAPET**

It indicates absurd command because of error and in particular if:

a) it is improbable (refer to para 6.2.3.1.)
b) in NRZ1 a block consisting of a number of characters included between 2 and 18 is read.
c) a block less than 18 characters is recorded, with the exception of the unitary blocks.
d) In NRZ1 - 7 tracks-parity a character will "all 0" is to be recorded
e) the beginning of tape spot is met during a reverse movement.

4.3.12. **SEGET**

It indicates there has been an error due to malfunctioning of the subsystem.
It shows in the following cases:

.EG01 - Data with wrong check bit.

.EG02 -a) Overflow in P.M.
b) Presence of flux transitions on tape while checking the erasing.

.EG03 -a) In recording a track is in "alert" (P.M.)
b) In reading two tracks are in alert, one of which is in self-correction (P.M.).

.EG04 -a) Presence of a spurious block which cannot be processed (P.M.).
b) Track not synchronised

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.EG05 -a) Threshold error in recording NRZ1
b) LRC error (NRZ1).

.EG06 - CRC error (NRZ1).

.EG07 - Character separation error, in recording at 800 b.p.i.

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4.4. TRANSFER SPEED

The nominal information transfer speed from and towards the medium is obtained multiplying the density by the trailing speed.

density	Trailing speed (i.p.s.) 18.75	37.5	75
200	3.75	7.5	15
556	10.4	20.8	41.6
800	15	30	60
1600	30	60	120

Frequencies in K chrt/sec

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5.0. OPERATION AND MAINTENANCE CHARACTERISTICS

5.1. Operating panel

The physical unit is not provided with an operating panel.

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5.2. Maintenance panel description

It is identified by three lamp boards located in positions N02, N03, N04 of the GUN 170 and one in the option in position B40.

The board in N02 presents the signals:

PE00 = controller and unit's ready
RENA = phase of erase recording
LENA = reading phase
AVAN = forward tape movement
MARE = unit in end of service or manual

The board N03 presents the signals:

CAPE = refer to para 4.3.11
NU10 = refer to para 4.3.8.
EGOL = refer to para 4.3.7.
ORNO = self-correction intervention
ESIN = synchronization error in the triggers exchange.

The boards in N04 and in B40 have the various error flip - flops EG00 - EG07 (refer to para 4.3.10. and 4.3.12.).

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5.3. FAILURES DIAGNOSIS

The failures diagnosis uses special diagnostic programs (drawing No.).

5.4. ALERT CONDITIONS

The controller ventilation group is provided with a protection device in case of lack of ventilation , whose intervention switches off completely the system.

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6.0. OPERATION THEORY

The physical unit consists of a basic controller, formed by devices which intervene both on the PM and the NRZ1 performance and of an option formed by specific devices for the NRZ1.

6.1. Decription at general block diagram level

6.1.1. Basic controller

The logic may be divided in nineteen groups, as it is shown in the general block diagram (drawing n° 14313082) of the GUN 170 (basic controller).

6.1.1.1. BA register

It is the storing device of information input and output, both towards central processor and tape handler.

6.1.1.2. BA check network

It checks the even parity of the information present in BA.

6.1.1.3. CO registers

They store the number of the unit selectedpreviously and of the unit to be selected.

6.1.1.4. Transfer network

It is a network presenting towardsthe interface 100 the characters to be sent to CPU, in addition it presents at the interface T2 the number of the selected unit, the command for the tape handler and the characters to be recorded.

6.1.1.5. Commands recognition

It is an assembly various networks which check the commands improbability and re-code the commands to be sent to the tape handler.

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6.1.1.6. **Commands storage**

The commands, which occupy the controller, are stored in this logic group and their performance is established

6.1.1.7. **RE register**

It is a divider which counts according to an internal generator. It serves to generate the clocks for the recording and to count the internal machine times.

6.1.1.8. **Timing**

It is a logic group defining the internal machine times and the succession of phases to check the tape movement.

6.1.1.9. **Recording logic**

It is a logic group which defines the phases to build up the block of data to be recorded and generates the triggers accompanying the characters.

6.1.1.10. **MA register**

It is a storing circuit auxiliary of BA. It serves to generate the flux transistions while recording in P.M. and to record the CRC during NRZ1 recording.

6.1.1.11. **Reading Logic**

It is a logic group which defines the phases to recognize and process the information block, arriving from tape and generates the pulses accompanying the data towards C.P.U.

6.1.1.12. **Reading channel**

It consists of circuits which transform the analog signals, arriving from the tape handler in digital pulses.
In addition, it detects whether the width of a signal goes below the allowed threshold.

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6.1.1.13. P.M. discriminator

It consists of a group of circuits which synchronizes the controller with the reading signals.

6.1.1.14. Deskewing buffer

It consists of the assembly of five registers in series , driven by nine shift registers.
It serves to recover the skew of the characters read in P.M.

6.1.1.15. LU register

It is register for the information transfer.
It serves check the parity of the characters before the self-correction network.

6.1.1.16. LU check network

It checks the parity of the information present in LU.

6.1.1.17. AL and NU registers

They are two registers which store the number of the track causing the error. In particular, AL indicates, in P.M., which track has the signal with a width below the threshold (track in alert), while NU indicates which track must be rigenerated by means of the self-correction.

6.1.1.18. Self-correction network

It is a network for the transfer from LU to BA and, if suitably driven, it regenerates a track which has given error, thus performing a self-correction.

6.1.1.19. Diagnostic Hardware

It is a logic group which modifies the functions of the controller to perform the diagnosis of failures through suitable programs.

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6.1.2. Optional part

The logic may be divided in eight groups, as shown by the general block diagram (drawing No. 14313084) of the GUN 171 (NRZ1 option).

6.1.2.1. SA Register

It is a register that processes the cyclic redundancy character (CRC).
It serves to calculate the character in recording and to check its correctness in reading.

6.1.2.2. SE register

It has the same performance as SA.
It serves to check the CRC in recording and to search for the wrong track in reading with self-correction.

6.1.2.3. Search for the wrong track

It is done by a network which, expoiting the contents of SA and SE, identifies the track to be corrected, or at least it checks that the block read cannot be corrected.

6.1.2.4. Reading channdl

It consists of a group of circuits which transform the analog reading signals to digital form.

6.1.2.5. LO register

It is a register which checks the correctness of the longitudinal check character (LRC) while reading.

6.1.2.6. Reading logic

It is a logic group which synchronizes the controller with the characters arriving from tape and checks the block format.

6.1.2.7. Errors check

It is a logic group which checks and signals the anomalous performance situation.

6.1.2.8. Diagnostic hardware

It is group of networks which processes the signals generated in the option and informs about them the diagnostic hardware present in the basic controller.

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6.2. DESCRIPTION OF THE FUNCTIONS AND PERFORMANCES AT INTERMEDIATE BLOCK DIAGRAM LEVEL

6.2.1. General Reset

All the unit storage circuits which, at the beginning of the operations, must certainly be in a defined status, are set by an OR of signals which are:

- CAGU clear, from interface 100
- MACU pulse generated by MARE when the tape is in movement.

For many storage circuits there is also an intervention from:

- TIVA pulse to start the performance of the controller commands.

In addition, for the diagnostic hardware purposes, it is possible to clear through a special command (hexadecimal , F/0 - binary 240).

6.2.2. Tape handler selection

6.2.2.1. ARSE

The central processor selects the unit by sending AEBE and PUOO which accompany the number of the units to be selected, expressed in binary and on the three bits AIFU-BIFU - CIFU.
The controller rigenerates AEBE forming the pulse TEBE which provides to the storage of the number of the unit in the register COSO ÷ 2 and to store in ARSE the arrival of the selection.

6.2.2.2. TEON

The AND of ARSE with the signal of tape stopped generates TEON which, after hawing set with SELO the information output dhannel on the T2 interface, sends the pulse TENU accompanying the name to the tape handler, finally resetting ARSE.

In addition, the presence of ARSE generates a signal (UPSE) which forces the conditions of interface, of unit and controller busy (MAPE and PEOO at logic level zero) and forbids the performance of tape handler commands.
The above mentioned signal lasts as long as ARSE plus 4 additional µsec., to cover the time needed by the status signals to stabilize on the interface.

6.2.2.3. SELU

The registers COSO - 2 and COOO - 2 are compared by means of the SELU network.
The positive result of the comparison allows to neglect UPSE for the indication of unit free.
Therefore the selection will not be sent to the tape handler and the controller will be able to accept a command right a nay, always having it and the unit available.

6.2.2.4. TEAN

There are at least two special cases at the arrival of a selection, while the previons one has not gone yet: the first one occurs with the tape still moving. In this case, the controller only updates the register COSO - 2
The second case occurs during the transitory phase while TEON is generated: then the controller updates the register COSO -2 overlaps another pulse toform TEUNU and increases the period of UPSE.

6.2.2.5. COOO - 2

Finally the failing of UPSE determines the transfer in COOO - 2 of the name of the selected unit.

6.2.3. Commands acceptance

A command is sent from Central Processor by means of the pulse TU20 and the condition VICU which accompany the code on channel AIFU - MIFU.
The controller, after having stored in BA the command code, performs some checks and decodings.

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6.2.3.1. Improbability checks

6.2.3.1.1. P022

It indicates that the command is not significant for the controller.

6.2.3.1.2. P023

It indicates the presence of a recording or erasing command on a tape inhibited for recording.

6.2.3.1.3. P024

It indicates the presence of a command "set seven tracks" destined to a nine tracks unit.

6.2.3.1.4. P025

It indicates the presence of a command which implies a reverse movement of the tape, while this one has the spot of the beginning on the B.O.T. photodiode.

6.2.3.1.5. P026

It indicates the presence of one the commands:
"Set Parity", "Set low density", "Set medium density" destined to a unit set for nine tracks; in addition, it indicates the presence of the command "Set high density" for units set only for P.M.

6.2.3.1.6. P027

It indicates the presence of a command "set high density" or "set P.M." destined to a nine tracks unit but not in B.O.T.

6.2.3.1.7. P028

It indicates the presence of a command for registration or unitary block registration (not of erasing) destined to units in B.O.T.

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6.2.3.1.8. P029

It indicates the presence of the command "set P.M." destined to sevev tracks units.

6.2.3.1.9. P034

It indicates that the command has a binary zero code (hexadecimal 0/0).

6.2.3.1.10. OCCU

It indicates that a command has arrived, but the controller or the unit are not available, or they are out of service ,or more than one unit has been selected simultaneously.
This indication is annulled by the subsequent selection.

6.2.3.1.11. ERBA

It indicates that the command has an odd parity check.

6.2.3.1.12. MEMA

It is a condition generated by the diagnostic hardware.

6.2.3.1.13 CONT - ESEG

They are the decodings of two diagnostics commands which must not be accepted.

6.2.3.2. Decodings

6.2.3.2.1. COUN

It is a network which distinguishes the commands which do not occupy the controller (refer to para 4.1.2.).

6.2.3.2.2. DA80 - DA87

It is network which decodes the commands to make the code comply with the interface T2. Its contents are stored by BA.

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6.2.3.2.3. Others

Other decodings define various commands and prepare their storage.

6.2.3.3. Commands timing and acceptance

The cycle starts with the arrival, from the Central Processor, of TU20, which stores in BA the command code and is rigenerated in TU22. If one of the checks, mentioned in para, 6.2.3.1. gives a positive result, TU22 provides to set interface condition CAPE and to give the TE30 pulse of signal received.
In addition, if there is the check error in BA, it sets the flip-flop ERCA and subsequently SEGE.
If, instead, the command is valid, TU22 generates either TU23 if the command is of the kind which does not occupy the controller or TU24 for the other commands. Finally it gives the TE30 for the commands "NOOP" and "set seven tracks".
TU23 is stored in COME and goes to question the decoding network mentioned in para 6.2.3.2.2.
The AND of COME and of UPSEN (refer to para 6.2.2.2.) determines the formation of TU25: pulse generating the TECOU for the tape handler and TE30 for the central processor.
The TU25 provides also to set at "1" the whole MA register, so that the configuration of the command, present in BA, may be sent to the T2 interface, through the Exclusive OR network.
TU24 triggers the mechanism to start the performance of the controller commands.

6.2.4. Controller commands storage

The initial phase of the performance of the controller commands stores the type of command and decides the tape movement.

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6.2.4.1. TERI

If the command plans a movement of the tape coherent with the one required by the previons command, TU24 is stored in COGO, which immediately generates TERI.
If, instead there is no movement coherence, the storage of TU24 occurs in ISTO which generates TERI only if the tape is not moving and the selection is not under way (UPIP and UNSE).
The leading edge of TERI stores in AVAN the direction of the movement of the tape imposed by the command under way.

6.2.4.2. TIVA

The trailing edge of TERI sets GOCU, signal which declares the controller busy. On its turn GOCU, in AND with the absence of selection under way and tape stopped or anyway during the stop phase (UPAP) and in AND with the absence of the delay phase at the stop (USTO), generates the TIVA pulse which gives the "start" to the tape movement, storing itself in VIAN; it stores the type of command setting one of the flip-flops: RENA (recording), LENA (reading), CANA (erasing), BUNA (unitary block recording), AUNA (reading with self-correction). PONA (tape back-space) it triggers the timing chain to build up the block and the gap.
After this, every command causes a specific phase which will be described further.
TIVA is generated also by TOVA, during the reading with self-correction.
At the end of the first and second run, the real stopping of the tape (refer to para 6.2.4.3.) generates TOVA, which provides to reverse the direction of the tape movement (AVAN) and to set, during the first run and reset in the second, the positioning flip-flop (PONA).

6.2.4.3. Tape stop

The tape stop phase starts from the moment in which the flip-flop timing the final gap USTO fails, whose negative

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edge resets the flip-flop VIAN, unless meanwhile, a command has arrived confirming the tape movement (COGO).
The incertitude determined by the lack of synchronism between the failure of VIAN and the arrival of the command is covered by the period of TERI.
Finally the signal UPIP goes beyond VIAN for the time necessary to the tape to stop physically.
The beginning of this phase makes the controller available (reset of GOCU).

6.2.5. Timing of the controller commands performance

The main timings are generated by means of the demultiplication of two oscillators (OSOO and OSO1), whose period is of 1041 μsec and 1500 μsec.

6.2.5.1. Oscillators check

The oscillators are used for two main purposes: the counting of long periods and the timing of characters.
These functions are driven by two flip-flops respectively : ANBO and BOBO.
In particular, ANBO actions always the 1041 μsec oscillator; BOBO instead triggers the 1500 μsec oscillator, if the operation is to be made with a density of 556 b.p.i., while it drives the other one, when the operation is made with the other densities.

6.2.5.2. RE divider (refer timing 14323198 sheet 6)

It is a binary counter consisting of seventeen stages in cascade, whose operation is driven by the oscillators.
The counting mechanism is such that the negative edge of the "positive" output of every stage falls while the level of the "positive" output of the subsequent stage, is certainly stable.
The first evolution pulse sets all the flip-flops at "1" and during the counting they all progressively return to "0".

To increase the performance frequency of the divider automatically, to adapt the times to the various speeds of the tape handlers or to change the density, the counting logic of the fourth, fifth sixth stage is changed. In particular, during the counting of the long periods or during the low density timing, RE03 divides RE02, otherwise it copies RE01, in low speed, RE04 divides RE03, which at medium speed copies RE03; at high speed RE05copies RE03 while for the other speed it divides RE04.
To define the various densities we use the decodings of the T2 interface signals "IM01" and "IM02" (para 6.2.10.5.1.) while the speeds are given by the pumper board FACI (ALVE, MEVE BAVE).
At the end of the counting of a time the divider is completely reset.
Only in some typical cases, only the last eleven stages are reset.

6.2.5.3. TORO - TORI

The main pulse, forming the clock for the counting, is TORO. It is generated by the negative edge of RE07, with the exception of the timing of the block in P.M., where it is triggered by RE05.
There is also an auxiliary delayed clock-trigger that is TORI generated by the negative edges of RE06 which find RE07 low.

6.2.5.4. Counting of long periods (refer to timing 14323198 sheet 8)

The counted times serve generally to build up some recording "gaps" or to determine the validation moment of certain machine functions.

6.2.5.4.1. Times performance

The performance of each timer occurs in the following may: a machine pulse sets a flip-flop which on its turn sets ANBO ; the oscillator OS00 is triggered and the divider RE starts its evolution.

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When the clock TORO finds ready a special decoding of RE, validated also by the mentioned flip-flop, it determines the end of the counting. ANBO, the divider RE, and the flip-flop are reset.

6.2.5.4.2. UVAL

It is the waiting time for the validation of reading.
It has a variable length in function of the speed: 1100 usec for the high speed; 2200 /usec for the medium speed; 4400 /usec for the low speed. It is triggered by TIVA if the tape is already moving, and by the reset of UVOL if the performance of the command implies the starting of the tape.

6.2.5.4.3. UVOL

It is a correcting time for UVAL which intervenes when the performance of the command implies the movement of the tape starting from the tape stopped.
It has a variable length in function of the speed: 300 /usec for the high speed, 330 /usec for the medium speed; 400 /usec for the low speed. It is triggered by the positive edge of the level which commands the tape movement (VIAN) and by the automatic command to pass from P.M. to NRZ1.

6.2.5.4.4. UNMO

It is the time to cover the transitory phase of selection of the reading circuits.
It has a length variable in function of the speed: 1160 for the high speed; 2050 for the medium; 3860 for the low.
It is triggered by UVOL and it lasts also during UVAL.
It does not reset ANBO.

6.2.5.4.5. UREG

It is the time of delay to recording.
It has a length variable in function of the speed: 4030 /usec for the high speed; 8066 for the medium speed; 16130 for the low speed.

It is triggered by the reset of UVAL if the command to be performed is of recording or erasing.

6.2.5.4.6. UNCA

It is the time required to erase two inches of tape.
It is triggered by the reset of UREG if the "erase" command is present.
It has a length variable in function of the speed: 21.3 msec for the high speed; 42.6 usec for the medium speed; 85.3 msec for the low speed.
In case of recording of the initial burst, (refer to para 6.2.6.5.) UNCA fails at the end of UPER.

6.2.5.4.7. USTO

It is the period of delay for the real stopping of the tape.
It is triggered by the recognition of the end of the information block on the tape or by the signal of spot of tape beginning met during reverse movement.
It has a length variable in function of the speed: 1.35 msec. for the high speed; 2.45 msec for the medium; 4.4 msec for the low speed. In case of back space, it fails only at the end of USTI.

6.2.5.4.8. USTI

It is the stop time related with the back space instructions and it is added to USTO by whose reset it is triggered.
It has a length variable in function of the speed: 3.25. msec for the high speed: 6.45 for the medium speed; 12.9 msec for the low speed.

6.2.5.4.9. UVIL

It is the time required to bring the tape zone, corresponding to the beginning spot under the magnetic head.
It is triggered by the set of UNMO if the tape is stopped at the B.O.T.

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It has an internal length variable in function of the speed: 36.3 msec for the high speed; 72.5 msec for the medium speed; 145.2 for the low speed.
The values of UVOL and UVAL must be added to these if the tape starts to perform reading instructions, while for the erasing instruction the times of UVOL, UVAL and UREG must be added.
Finally, it must be kept in mind that the counting of the times does not start with "TIVA", but from the moment in which the B.O.T. (BOTAU) fails. The reset of UVIL does not reset ANBO, therefore the times which follow must take into account the evolution status reached by "RE".

6.2.5.4.10. UBER

It is the time identifying itself with the passage of the part of tape corresponding to the B.O.T. spot under the magnetic head.
It is triggered by the reset of UVIL.
It has a length which is variable in reading and in erasing, and variable in function of the speed: for the high speed : 4.2. msec in reading and 12.7 msec in erasing; for the medium speed: 8.5 msec in reading and 25.5 in erasing; for the low speed: 17 msec in reading and 51 msec in erasing.
The reset of UBER resets ANBO.

6.2.5.4.11. BOFA

It defines the length of the recording of the initial burst in P.M..
It is triggered during the evolution of UVIL in erasing and in particular at a distance of 17 msec or 34 msec or 68 msec, depending on the high, medium or low speed, from when UVIL performs its internal counting.
BOFA fails at the end of UBER.
The recording trigger in this phase is obtained from REO2 or REO3 or REO4 for high, medium, low speed because, as ANBO is still on, it is not possible to make BOBO start, therefore, the recording pulses cannot be generated in the usual way (refer to para 6.2.7.2.1.).

6.2.5.4.12. UPER

It is the time which increases the erasing at the beginning of the tape by 4.5 inches beyond the spot, both in NRZ1 and in P.M.
It is triggered by the end of UBER.
It has a length variable in function of the speed; 59.6 msec for the high speed, 119.3 msec for the medium speed, 239 msec for the low speed.

6.2.5.4.13. Service pulses in timing

The showing up of the signal UVOL, and in its absence UVAL generates the first edge which makes the ANBO mechanism to start, by means of TURO. This edge is not efficient when the tape is at B.O.T., therefore it is necessary to wait for the signal tape BOTAU to fail and only then ANBO will be triggered. The reset pulses of the various timer flip-flops go in OR to reset ANBO which provides to generate TURO.
If, meanwhile, another timer has been reset, the cycle starts again.
In addition, TURO, which may also triggered by BOBO, has the function to set BOBO itself, if it is performing the recording instruction.
TURO has also the function to reset the register RE.
To avoid the showing up of a wrong TORO or TORI, TURO (TURE) goes to block them.

6.2.6. Erasing instruction (refer to timing 14323198 sheet 5)

The performance of this instruction implies only a two-inches tape movement, with the selected recording head, but without sending triggers, which could generate flux transitions on the tape.
The tape movement is checked in three typical phases:

6.2.6.1. First phase

The first phases corresponds to the building up of the final part of the inter record gap, therefore the timing flip-flops UVOL, UNMO, UVAL, UREG (refer to chapt 6.2.5.) are triggered one after the other.

6.2.6.2. Second phase

The second phase corresponds to the erasing time established by UNCA (refer to para. 6.2.5.4.6.).

6.2.6.3. Third phase

The third phase corresponds to the building up of the first part of the inter record gap, therefore USTO is triggered (refer to para. 6.2.5.4.7.).
The interval between the blocks will be completed by the following recording.

6.2.6.4. Checks

During erasing, a check for the complete absence of flux transitions on tape is done through the reading channel.
A possible error is stored in EGO2.

6.2.6.5. Erasing of beginning of tape

The performance of this instruction, starting from B.O.T. implies the intervention of other timing circuits, to allow the operation on the part of tape going from the beginning to about four inches beyond the zone corresponding to the B.O.T. spot.
The interested flip-flops are in sequence UVIL, BOFA, UBER, UPER (refer to chapt. 6.2.5.) in addition to those which intervene in normal erasing.
In P.M., during BOFA, the "BURST" is recorded allowing to send recording pulses (TEREU) to the tape handler (refer to para 6.2.5.4.11.) while on the information channel only track 4 (MIFU) is enabled. The checks mentioned in para 6.2.6.4. are done only after the "burst".

6.2.7. Recording instruction

This instruction serves to transfer the information on tape. Its performance implies the building up of the data block and the service characters, and the generation of the inter record gap.

6.2.7.1. Inter record gap

The inter record gap is generated in two phases: one part is generated before writing the block istelf, using the times UVOL, UNMO, UVAL, UREG; the other part shows after the block and its length is calculated starting from the end of the check reading, for the time of USTO

6.2.7.2. P.M. block building up (refer to timing 14323198 sheet 9)

The block building up is obtained by sending the pulses which accompany the information on the channel towards the tape handler.

6.2.7.2.1. TEREU - REREU

The TEREU pulses are generated by TORO (refer to para. 6.2.5.3.) and are enabled by PREA in AND with COTE.
They serve to issue alternatively data transitions (TODA) and "phase" transitions (TOFA).
REREU is a service pulse which resets the recording flip-flops on the unit and serves to guarantee the magnetization sense of the tape in the inter record gap .
It is generated with the beginning of the delay time to recording UREG.

6.2.7.2.2. Information transfer to tape handler

The information are sent on the channel through an Exclusive OR network between two registers BA and MA, on which also some forcings for special conditions are done.

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6.2.7.2.3. Building up of the pre-amble

With the pulse TIVA (refer to para 6.2.4.2.) both BA and MA are completely set, so that all the outputs of the Exclusive OR are at logic level "1", which means to enable the flux transistions.
At the end of the delay time to recording (UREG) PREA is set, which, on its turn, sets BOBO.
BOBO triggers the oscillator OSOO and the counter RE starts to evolve; the pulses "TORO" begin to come out driven by the flip-flop RE05.
The first TORO goes to set the COTE flip-flop which, in AND with PREA, goes to enable the recording triggers TEREU, issued by TORO.
As it may be seen from the "timing 14323198 sheet 9", the first recording pulse done with the second TORO, corresponds to the recording of one datum: in fact, the Exclusive OR, being blocked by FA06N, has the information towards the unit at logic level "1"; therefore on all the tracks there is a flux transition.
In particular, being at the beginning, the flux in the gap was oriented uniformly on all the tracks, therefore also the flux transitions will be uniform, which corresponds to the writing of the first character with "all zero bits" of the pre-amble.
The next TEREU will not find anymore FA06N to block the Exclusive OR and therefore it will generate the possible flux transistions in order to "rigenerate the phase", i.e. to bring the flux back so that, on every track, at the next TEREU, it will be possible to cause a flux transition in the sense coherent whith the bit of the datum to be recorded.
For the whole period of the pre-amble, BA and MA remain the same, therefore the Exclusive OR presents the information at logic level "1", so forty bits zero and forty phases are thus recorded on all tracks.
The TORO which corresponds to the recording of the fortieth datum "all zero", resets the registers MA and RE and sets the flip-flop BORE.

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In this way, the next TORO provides to make the first request of data to the Central Processor, while the corresponding TEREU will find the information at logic level zero, as BA is different from MA.
Therefore there are no phase transitions and the next datun will be a "all bits one".

6.2.7.2.4. Building up of the character block

During data recording, the TU20 accompanying the characters which are stored in BA arrives from the central processor. Simultaneously the contents of BA are transferred in MA.
At the following TERE there are the phase transitions only for those tracks which have the same bit in BA and MA: in this way, the recording of the character present in BA is prepared; simultaneously the request for the next character is sent.
This mechanism goes until the arrival, from central processor, of the signal of end, TU20 . FINU, which resets BORE.
At every TU20, a TE30 answering pulse is sent to the central processor.

6.2.7.2.5. Building up of the post-amble

The reset of BORE causes the set of the flip-flop POSA which goes to enable a complete set of the register BA (TOPO) performed by a trigger TODA.
In this way, the next TEREU prepares the phases to record the character "all bits 1"; the simultaneous TORO resets POSA and sets PISA.
The TODA corresponding to the recording of "all 1" goes, enabled by PISA, to reset completely MA (TOPI); in this way, the next TERE will not generate any phase, being BA different from MA; meanwhile PISA is reset and PESA is set.
Also the register RE which will have to count the "zeroes" of the post-amble is reset.
The subsequent TODA, finding the gate validated by PESA, gives a general set to MA (TOPE).
Therefore, being BA equal to MA, the information on channel towards tape handler will allow to cause flux transitions at

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every TEREU and on all the tracks.
When RE has counted eighty TEREU, as PREA and PESA are reset, the recording will stop.
The tape will go on to generate the interblock.

6.2.7.3. Building up of the block in NRZ1
(refer to timing 14323198 sheet 24)

Also in NRZ1, the block is built up sending the pulses which accompany the information on the channel towards the tape handlers.

6.2.7.3.1. TEREU - REREU

The pulses TEREU are generated by the clock TORO with the enabling of PREA and BORE for the information; and by the gate MUTO for the CRC.
The LRC is instead recorded by means of the pulse REREU, which is generated at the end of the block and as a precaution at the end of UREG.

6.2.7.3.2. Information transfer towards tape handler

The information are sent on the channel through the same network of Exclusive OR used in P.M., but the register MA is maintained permanently all at "1", so BA is presented completely to the interface T2.
In the case of the CRC, instead, the character is in MA and BA is kept all at "1".
The LRC is recorded automatically by the reset of the recording flip-flops of the tape handlers.

6.2.7.3.3. Building up of the character block

A complete set to the registers BA and MA is given by the pulse TIVA.
At the end of UREG (refer to para 6.2.5.4.5.) BORE is set, and consequently, BOBO and are of the oscillators.
The TORO begin to come out, generated by the flip-flop RE07 therefore they origin to the TOFA and not to the TODA.

The first TORO provides to make the first character request to the central processor (TE 10). The answering TU20 sets PREA and gives the TE30 of reception.
The following TORO generates the TEREU accompanying to the handler the character which hasbeen just stored in BA.
Finally this same TORO has made another request of data to the central processor.
This mecchanism is repeated until the arrival , from central processor, of the signal of end (TU20 . FINU).
At this point this phase is over, FILA is set and BORE is reset.
For the seven tracks there is an additional peculiarity, in the performance with the odd parity check bit: after having stored in BA the character arriving from Central Processor , a check is made on whether the bits of BA06 and BA07, i.e. GIFU and LIFU (which are not sent to tape) are different.
In this case, the check bit (MIFU), present in BA08, is inverted through PABU.
The inversion of BA08 occurs also with seven tracks in parity if BA06 and BA07 are the same (DITU) or if from Central Processor a character arrives, with all bits "zero" exoepet for GIFU or LIFU (PABA).

6.2.7.3.4. Service characters

At the end of the building up of the data block, the controller provides to generate the service characters to be recorded on tape.
The first character must be recorded at a nominal distance of four characters from the last one of the data block.
In the nine tracks systems, it will be the CRC, while for the seven tracks it will be the LRC.
The counting of this interval is done as follows: when BORE fails, the flip-flop POSA shows.
The next TOFA resets POSA and sets PISA.
At the following TOFA PISA fails and PESA and CILE show.

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A third TOFA sets PUSA and finally the fourth TOFA finds the enabling to make the TEREU start, if with nine tracks, or the REREU if with seven tracks.
Meanwhile, with a nine track performance, the CRC (refer to para 6.2.7.3.5.) has been processed, which with the pulse TIPI is then transferred from SA in MA, while BA is all at "1" and RE is reset.
After the recording of CRC, with RE a time equal to four characters is counted, then there is the enable to send the REREU for the recording of the LRC with nine tracks.
The RERE implies, both with seven and nine tracks, the reset of PREA and PESA and the starting of the stop phase.

6.2.7.3.5. CRC building up

The cyclic redundancy character is the result of a special processing of the characters forming the block.
Its functions is to provide a comparison datum to check the the loss or the acquisition of a bit along the block, and eventually to define the track in which the error has occured.
The processing occurs in two phases, α and β within every character.
The phases are enabled by the flip-flop PASA, which shows right after the first data request with TORI (refer to para 6.2.5.3.) and fails after having enabled the TORO subsequent to the recording of the last character.
There is then a final operation enabled by PISA.
The operations are performed with the register SA, which is reset in the initial period of the tape movement.
The phase α driven by the TORO simultaneous to the recording of the character, performs a comparison in Exclusive OR between the contents of BA and SA and the result of the operation returns to SA.
This one, being a shift-register, stores the character and performs a rotation step.
In addition, as this device is used for the reading check, both with tape forward and reverse we are giving the complete table.

- Forward recording and reading

BA00 Exclusive OR with SA06 and transferred in SA07
BA01 Exclusive OR with SA05 and transferred in SA06
BA02 Exclusive OR with SA04 and transferred in SA05
BA03 Exclusive OR with SA03 and transferred in SA04
BA04 Exclusive OR with SA02 and transferred in SA03
BA05 Exclusive OR with SA01 and transferred in SA02
BA06 Exclusive OR with SA00 and transferred in SA01
BA07 Exclusive OR with SA08 and transferred in SA00
BA08 Exclusive OR with SA07 and transferred in SA08

- Reverse reading

BA08 Exclusive OR with SA06 and transferred in SA07
BA07 Exclusive OR with SA05 and transferred in SA06
BA06 Exclusive OR with SA04 and transferred in SA05
BA05 Exclusive OR with SA03 and transferred in SA04
BA04 Exclusive OR with SA02 and transferred in SA03
BA03 Exclusive OR with SA01 and transferred in SA02
BA02 Exclusive OR with SA00 and transferred in SA01
BA01 Exclusive OR with SA08 and transferred in SA00
BA00 Exclusive OR with SA07 and transferred in SA08

Phase β driven by the TORI subsequent to the TORO of phase α, causes an inversion in the status of the flip-flops SA01, SA02, SA03, SA04 with the condition that SA07 be at "1".

The final phase consists of the introduction of an additional character trough a supplementary α phase. This character in reading will be the CRC read, while in recording it will be a "all zero" obtained blocking the gates of the Exclusive OR, where BA shows, with the flip-flop SOLA.
This flip-flop is set by the last phase β and inhibits the signals COAV and COIN.
At this point a "preliminary" CRC is obtained, whose format has an odd number of "bits 1", if the number of the block characters was odd and viceversa if it was even.

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We may, though, meet also the case in which the LRC character consists of "all bit 0" and therefore it may not be detected reading.
To solve this inconvenience an odd character is added in SA, performing a final inversion SA01 and SA03.
This operation is performed by a TORI enabled by PISA (refer to para. 6.2.7.3.4.).

6.2.7.4. T.M. block recording in P.M.

This instruction corresponds to a normal recording as it concerns the tape movement.
For the information, the only character sent by C.P.U. is not used, and a forcing (VARU) enabling only some tracks and inhibting others is done on the Exclusive OR BA-MA.
In this way neither the pre-amble nor the block nor the post-amble are recorded while the whole logic works regularly
So hundred and sixty-six flux transition at a density of 3200 b.p.i. are caused on tracks AIFU, BIFU, FIFU.
The other tracks are erased.

6.2.7.5. Recording of the initial burst in P.M.

Refer to para 6.2.6.5.

6.2.7.6. Recording of unitary NRZ1 blocks

With seven tracks, it is a normal recording, but in the systems with odd parity check the inversion of the contents of BA08 is inverted by means of the decoding BUBA.
In fact, the tape mark goes always with the even parity check.
Also at nine tracks, the recording procedures are normal , with the exception of the recording of the CRC which is blocked, inibiting on MUTO to send TEREU.

6.2.7.7. Checks (refer to timing 14323198 sheet 10)

Both in P.M. and in NRZ, the recording checks are done mainly by means of the simultaneous reading of the block (refer to para 6.2.8.3.5.).
A check is done on the parity of the characters that are in

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troduced in BA, using the ERBA check network (refer to para 6.2.8.29.).
The synchronism of the pulse exchange with central processor is checked, through the flip-flop TETU activated by TE10 and TU20 (refer to para 6.2.8.3.1.).
Finally the characters separation at high density is checked (refer to para 6.2.8.36.).

6.2.8. Reading instruction

This instruction serves to call the data back from tape and to transfer them to the central processor. This implies to move the tape to reach the recorded area to receive the messages, to check them and eventually to correct them.

6.2.8.1. Initial phase

Initially a general set is given to the registers BA, MA and to the flip-flop VIAN; and a reset to the registers LU, SA, SE, NU and to the deskewing buffer.
After this the part of tape corresponding to the interblock runs under the reading head, and the flip-flops UVOL, UNMC and UVAL start to work; a selection is made also for the analog circuits to amplify the reading signals.
At the end of UVAL, COLE shows, whose function is to enable the flow of characters and then processing.

6.2.8.2. P.M. reading channel

The information arrive from the T2 interface in "analog" form and are rigenerated in the "RIFI" and "RARI" boards.
After this, the ZEDE boards distinguish, in two fluxes of digital pulses (PIUX and MENX), the positive from the negative semi-waves.
In addition the boards SOGU give a signal if the width of the signal goes below a safety threshold (refer to timing 14323198 sheet 11).

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The boards of the channel are specialized for the trailing speeds.

6.2.8.3. Characters counter (refer to timing 14323198 sheet 7)

During the reading it is necessary to count the characters , to give the validations or to do some checks.
For this purpose, BOBO is activated and so some TORO's are obtained at the "nominal" rithm of the characters being read.
The CA counter counts accoridng to these TORO's enabled by the OR of UNSE, UNCO, UNIN, NU10 and VEIN.
Once the various counting decodings are reached, these flip-flops are reset and also CA is cleared.
The use of the flip-flops will be described at the moment of their use.
In the NRZ1, the counter CA evolves according to the pulses which identify the characters to be sent to Central Processor.

6.2.8.4. Synchronization of the P.M. reading (refer to timing 14323198 sheets 12, 14)

The synchronization operation occurs while reading the preamble where it is known there are only data "all bits zero".
In addition, it is done autonomously for every track as a skew of the bits of the same character is allowed, equal to four characters in reading, and two characters in recording.
The synchronizatio starts with the arrival of the first bit of the most advanced track which goes to set UNSE.
After a time of four characters all the tracks will have to be present, then the flip-flop UNDI, previously set by TIVA, fails and goes to enable the reset of the nine STAX flip-flops, whose function is to stop the discriminator.
In fact, they have been set by TIVA, to cover the noises before the block.
At this point, the first PIUX of every track sets its related STAX, which tiggers the oscillator PILX (PHOS boards).
The output pulse of the oscillator is in correspondence both of the PIUX and MENX pulses and it tries to adjust at their rithm.

The output of the oscillator makes the flip-flop GATX work, whose task is to divide the pulses PIUX corresponding to bit 1 from those which correspond to "phase" transistions.
But, to guarantee that GATX has the right rithm, for the whole length of UNSE, equal to 28 characters, it is reset with MENX, i.e. with the pulses that in the pre-amble surely correspond to the data.

6.2.8.5. Data discrimintion (P.M.) (refer to timing 14323198 sheet 15)

When UNSE fails it is assumed that all the tracks are synchronized and the oscillators work at the correct rythm; therefore BOLE and PETA are set. BOLE means that block is ready to be read. PETA goes to close the gate through which the MENX reset the GATX and enables the pulses generators mask DATX.
These pulses correspond to some bits 1 of datum (and not of phase).
The guarantee of this is given by the GATX which, when they are set, keep the DATX outputs grounded.
In addition, when the GATX are set, the CLOX clock pulses start, announcing the arrival of data: if, before next clock, a BUOX will show it will be bit 1, otherwise it will be bit 0.

6.2.8.6. Deskewing buffer pre-setting (P.M.)

The first bit 1 of every track, i.e. the one of the pre-amble key, go to set the flip-flop INOX.
The subsequent CLOX will find the gate open to set the SIAX.
Simultaneously, they will reset INOX to avoid other sets of SIAX along the block, and will set INAX to avoid that other BUOX's set again INOX.

6.2.8.7. Deskewing buffer (P.M.).

It is a register pre-set to accumulate serially up to four bits of every track, plus a margin cell, whose capacity is below one character, considering the performance of the unit.

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Its function is to receive the tracks separately, allowing a skew of four characters minus "E", i.e. minus the electronics recycling times of the device.
It will then be possible to take out in parallel and simultaneously, from the deskewing buffer, the bits of the same character.
The performance of the buffer is organized in two phases: the filling and the emptying.

6.2.8.7.1. Filling of the deskewing buffer (P.M.)

The filling of the buffer is done automatically in every track. Therefore there are nine of the following devices: five flip-flops (SIAX - SIEX) connected as "shift-registers " which work as input selectors for the other five flip-flops (DIAX - DIEX) which are information storage.
When the pre-amble key shows, the first one of the SIAX selector flip-flops is set at 1: in this way it allows to store the possible bit 1 (BUOX) in the corresponding storage (DIAX).
The subsequent clock (CLOX and CLAX in reading and CREX in recording) will move the "1" from the SIAX to the following, SIBX, enabling the storage DIBX.
In recording the shift closes from SICX to SIAX, thus reducing the capacity of the register to two characters; while in reading the closing is from SIEX to SIAX.

6.2.8.7.2. Emptying of the deskewing buffer (P.M.)

The emptying occurs through a single output selector, which evolves asychronously with respect to the filling of the register.
The selector consists of a series of flip-flops connected as shift-registers (SELA - SELE) and, to trigger it, the first flip-flop SELA is set at "1", when the pre-setting of all the input selectors has been completed (TOLE).
In this position a gate is enabled to which the first flip-flops of the input selectors (SIAX) arrive.
As soon as these ones have made a stop forward, the coincidence occurs.

I.e., the clocks of all the tracks have moved forward the selector register "moving forward" the "1".
It is clear that a track skewed in advance will have had its selector make more steps, but only when all the homogenous, flip-flops (i.e. SIAX)go to "0"we can be sure that the whole character has arrived in the register.
Therefore all the conditions arriving on the COIA part are satisfied; thus the coincidence occurs and if BOLE is present TULU shows: TULU is the pulse which triggers the pulling out of the character from the deskewing buffer and transfers it in LU; TULU makes the output selector move a step forward thus enabling the pulling out of the character from the next cell (i.e. SIBX) and resets the contents of the cells just used.
After this, the pulling out of the next character occurs.

6.2.8.8. LU register

This is the first register in which the cha read is present simultaneously with all its bits.
The transfer of the deskewing buffer in LU occurs through an AND-OR network: nine OR's to each one of which five AND's arrive occured between the output selector and the contents of the information storages.
The updating of LU is done both by set and by reset.

6.8.9. ERLU

The check network controls the parity of the characters present in LU.

6.2.8.10. Transfer from LU in BA

The character in LU is subsequently transferred to BA through a network which, in case of identification of wrong track, self-corrects the character itself inverting the bit of the signaled track (refer to para 6.2.8.2.2.).
Also the updating of BA is done by set and reset.

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6.2.8.11. Timing of the characters transfers (P.M.)

The TULU pulse sets the ORTI flip-flop which makes TUBA and TEBA show if there is not under way the pulling out of a previous character (UNTI), if a certain period of time has elapsed since the same previons operation (URTI), and if the controller has not decided to interrupt the data transmission.
TUBA is the pulse which generates TILU to update LU and in reading to transfer LU in BA (TIBA).
Its length has been fixed at 1 /usec.
TEBA is a service pulse which lasts 1.5 /usec, after which TEME shows, another service pulse which identifies the stabilization of the registers contents.
Another service pulse is TIME, generated by TUBA and its characteristic is to have a strict advance of 0,5 /usec on TEME.

6.2.8.12. P.M. reading logic (refer to timing 14323198 sheet 11)

We have already seen that UNSE sets BOLE and that at a certain point the information block, through the various registers, ends up on the interface channel. Note that the register MA does not disturb the exclusive OR because it is all at "1".
The TE20 accompanying the characters to C.P.U. are generated by TEMEN, which on its turn generates TIDA and then TEDA, starting from the first character set in BA until the key of post-amble beginning (FIFA) is recognized or anyhow until the controller shows the characters unreliability (FAFI).
In particular, the eventual presence of a character "all 1" in LU is stored in LUME, by means of TIME.
The TEME of the next character, if it finds the decoding of "all 0" ready in LU, checks the key of post-amble beginning, and sets FAFI.
LUME is reset by TUBA which follows a character different from "all 1" in LU.
After this, the reading of the post-amble goes on, but, as there are not anymore either TUBA or TIME, through UNON

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the FINE shows, which on its turn generates a TE20 through UNFE, and imposes on the interface channel the binary character 31, the so called IS1.
When all the reading signals end, the signal ENRI which resets BOLE will fall.
So TOTO is generated, which triggering USTO starts the phase of tape stop and frees the controller.

6.2.8.13. NRZ1 reading channel

The signals arriving from the T2 interface pass through the boards RIFI, which have an output from which the signal for the NRZ1 channel comes out, with the exception of the bits GIFE and LIFE in the seven tracks performance.
The channel NRZ1 consists of the boards ALFI, PIDE, DOSO in the various models for the various trailing speeds.
The performance of the ALFI is conditioned to the fact that the tape be moving, with the exception of the period during which UNMO lasts (refer to para. 6.2.5.4.4.).
The DOSO are enabled by the permission to read CODO, and checked by SOAL in reading or by SOBA in recording. The DOSO has also an out-put which indicates whether the level of the signal is too low.

6.2.8.14. NRZ1 block reading

The reset of UNVAL goes to generate a TULO and a TALON, with which the deskewing buffer is pre-set (refer to para. 6.2.8.7).
In NRZI this register has only the function of transition station for the character. The various outputs of the DOSO (LA00-8) go in OR at the BU00-8 of the phase modulation and so they enter the above mentioned register.
The outputs of the reading channel go in "OR" also among themselves (ORB1) and set the flip-flop BIOR.
BIOR, on its turn, sets ORTI, so that a TUBA and a TEME show but a TE20 does not start.
After a certain time (refer to para. 6.2.8.15.) a pulse, GATE, shows which has the function of single clock for all the tracks.

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A TULU is thus generated which transfers the characters contained in the deskewing buffer to LU. All the selectors, of input and output, make a step forward. GATE resets also BIOR.
At the next ORB1 and therefore at the next TUBA, the character present in LU passes to BA.
After 1.5 /usec. TEME shows and generates the TE20 accompanying the character to C.P.U.
In the seven tracks performance, in LU, the expansion from seven to nine bits occurs.
I.e. LU07 copies LU05 and LU06 copies LU05 inverting (D167 and D176).
In addition, with the performance with even parity an inversion is made of the contents of the flip-flop LU08, i.e. the check-bit, by means of TI28 and DI08, R128, DI80.
At the end of the reading the signal of end (FINE) is generated, if it has not yet been given by central processor.
On its turn, the FINE starts in C.P.U. a TE20 (by means of UNFE) and it imposes on the information channel the character "IS1" giving also a general set to BA and MA.

6.2.8.15. "GATE" (refer to timing 14323198 sheet 25).

By "gate" we mean the device generating the time within which it is necessary that all the bits of a character arrive to the controller.
This device consists of a delay line, triggered by BIOR which recyles a certain number of times until established time has elapsed.
This is performed by a cycle counter (00BI ÷ 04BI) which evolves until a certain decoding is satisfied.
When the GATE pulse shows, the counter is reset.
The decodings are three, in function of the various speeds (B001, B002, B003).
In addition, the recyles start again from various delay levels in function of the various recording densities.

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The GATE times are the following (given in µsec):

Density (b.p.i.)	Trailing speeds (i.p.s.) 18.75	37.5	75
800	31.2	15.6	7.8
556	45.6	22.8	11.4
200	57.6	38.8	14.4

6.2.8.16. NRZ1 reading logic - with movement forward
(refer to timing 14323198 sheets 26, 28)

This logic has the task to check the various phases of the block reading.
At the reset of UVAL, TULO is generated which goes to set COEG, permission to reading.
The first TUBA sets BOLE, flip-flop identifying the length of the effective block reading.
After the TUBA the first TULU shows which sets BOBO, CEBA and SIDA.
The function of CEBA is to enable the control of the check in BA and to validate the recognition of the characters as information, distinguishing them from the service character CRC and LRC and enabling the triggers accompanyng the characters to C.P.U. (TE 20).
SIDA, instead, enables the recognition of some decodings of RE, which is made evolve by BOBO, and therefore counts the times corresponding to the rythm of the characters in reading.
The first decoding which interests us is T008, which shows, at a nominal distance of 1.5 characters from the last ORBI.
During the block, T008 never comes out because, at every ORBI, BOBO is reset and therefore RE does not succeed to evolve sufficiently.

At the end of the information, before the service characters, there is a four character "gap", so T008 may show and set the flip-flop BUCO, which will be reset by a VATU i.e. by the next character.

Another decoding is TO10 which shows at a nominal distance of 4.5 characters from the last ORBI.
Its task is to simulate a character, as for example a CRC with all bits zero.
In fact, it goes to generate BIOR in OR with ORBI and resets BUCO.
When BUCO fails, CEBA fails, too.
In fact, up to this moment there is the last character in BA.
The next TUBA will transfer there the CRC, at nine tracks, or the LRC at seven tracks.
This same TUBA gives the set to INSA, whose application will be seen for the CRC check, beside avoiding a new set of BUCO.
In addition, at nine tracks, as there is a gap also between CRC and LRC, with CEBA it is avoided that another TO10 shows.
Finally, there is the possibility that at seven tracks, the character LRC be consinting of all bits "0" and so cannot be detected. In this case the TO10 will simulate a character and the reading can take place normally.
The last pulse is the TO18, which shows at a nominal distance of 5.5 characters from the last ORBI.
It means that, in consideration of the excessive space from the last character, it may be assumed that the block is over and to reset BOLE.
BOLE, failing, generates TOTO: pulse commanding the stop to the tape and giving the signal of FINE.
On its turn, FINE causes a further TE20 and imposes on the interface the binary character 31, so called IS1.

6.2.8.17. NRZ1 reading logic, with reverse movement

(refer to timing 14323198 sheets 27,29)

The reverse reading, even if it exploits the same devices of the forward reading, presents some difficulties, as the block is different at seven or nine tracks.
At the beginning of the tape movement NOLO is set, with which the CRC check is stopped and the setting of NQCO is enabled.
The first character which arrives is the LRC. Its TUBA sets BOLE, and its TULU sets BOBO and CEBA.

At this point the controller is ready to read the block.
As, after the LRC, there is an interval, BUCO shows which, at seven tracks, lasts until the TUBA of the first information character of the block; while, at nine tracks, it will last up to the TUBA of the CRC.
The setting of BUCO sets also NOCO: in this way, also the generation of the TE20 is inhibited, in fact its presence means that the service characters are being processed.
At seven tracks, at the first TULU, NOLO, BUCO and subsequently NOCO are reset, and then the block is normally read.
At nine tracks the end of the first BUCO causes only the reset of NOLO. After the CRC, or its simulation done with T010, BUCO will show again and at its failure also NOCO will be reset, starting thus the normal reading of the block and the transfer of the characters to central processing.
At the end of the characters, the three pulses T008, T010 and T018 will come out.
In particular T010 simulates a character and the corresponding TEME transfers to the central processor the last character set in BA.
At seven tracks there is the possibility that the LRC be a character with all bits zero.
In this case the reading logic behaves as for the forward movement and NOLO is reset at the second character.

6.2.8.18. Reading of the T.M. block in P.M.
(refer to timing 14323198 sheet 12)

The reading of this special block occurs recognizing that on certain tracks there are some flux transitions, while other tracks are completely erased.
For this purpose, the signals arriving from the boards SOGU (refer to para. 6.2.8.2.) are used: in fact the erased tracks will always be below the threshold.
This recognition occurs during the synchronization phase, during UNSE (refer to para 6.2.8.4.).
At the end of UNDI eight RUDIN pulses show up for three times and, after having given a reset to the ALAX flip-flops ,

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they go to test the tracks conditions storing, in BLAN, the positive result of the recognition.
At the end of UNSE this information is transferred in BLON and the interface condition FISE is set.
In this case PETA does not start and therefore the information channel from tape handler does not work.
Instead, a binary character 19 is sent to central processor by setting BA and MA and by impositions on the output network.
The accompanying TE20 is also generated by BLON by means of UNFE.

6.2.8.19. Reading of the unitary block in NRZ1
(refer to timing 14323198 sheets 30, 31, 32, 33)

6.2.8.19.1. At 7 tacks

The readingof the unitary block at seven tracks corresponds to a normal reading. The only difference is that the character counter CA stops at one, giving the signal FESE and allowing the setting of FISE.
The parity of the character is guaranteed by REL8 which acts on LU08 maintaining it reset, while the expansion from seven to nine tracks occurs normally.
In addition,the only character recognized as "tape mark" it is the 79 binary.

6.2.8.19.2. At 9 tracks

At nine tracks the controller behaves as if it was reading a block whose CRC was a "all bit zero".
In addition, as the characters counter stops at one, FESE and subsequently FISE show.
The character may be any one of the graphic set.

6.2.8.20. Reading of the unitial burst.

6.2.8.20.1. Recognition

The burst function is double; in the forward movement it

serves to recognize the beginning of information on tape, and how it is recorded, i.e. whether in P.M. or NRZ1, in the reverse movement, it serves to recognize the beginning of the tape before the signal of the B.O.T. photo-cell.
The recording of the burst is done in P.M. only, while, in NRZ1, in the corresponding area of the tape, there is an erasing of all the tracks.
The burst recognition, during the forward movement, occurs during UBER (refer to para. 6.2.5.4.10.) testing whether track 4 (SEA8 - MIFU) has been recorded.
This operation occurs through the output of the SOGU board indicating whether the signal is present or not.

6.2.8.20.2. Use of the burst with forward movement

The tape handler, at the beginning of the work, is set in P.M. by means of clear; the recognition of the burst confirms (SORO) this presetting and it is stored in NORO.
Otherwise the signal FORI is generated, at the end of UBER. With this pulse a trigger accompanying the commands to tape handler (TECOU) is generated and simultaneously the code of the command "set high density" is imposed on the interface channel. The imposition is done with PONO and resetting the BA register.
It must be noted that the reset of BA is done by means of a TIBA which transfers in it the contents of LU, previously reset by TIVA.
In this way the P.M. reading channel is freed and the controller passes to NRZ1 operation.
At the end of the burst, the signal OSEA shows again and, through a delay, it goes to reset NORO.
The delay (UNRO) is equal to about one third of an inch; it serves for protection against accidental reductions of signal which would simulate absence of burst.

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6.2.8.20.3. Use of the burst with reverse movement

During reverse movement, the burst is used when, by mistake, a reverse reading command has been gives before the first block, therefore the reading stops right away and the tape goes until B.O.T.
The burst is recognized in reverse detecting only whether there are signals on track 4.
This operations occurs during the synchronization phase and the positive result is stored, by RUDIN, in BURS.
When UNSE fails, BOLE is not set. If, though, meanwhile, OSEA shows again, i.e. all transitions on tape disappear, also BURS fails, as probably a false recording was met.
The tape goes on it its movement until BOTAU shows, so CAPE and the pulse TOTO is generated, which commands the tape stop phase and gives the end (FINE) to the computer.

6.2.8.21. Reading with end from central processor

Both in P.M. and NRZ1, the reading occurs according to the procedures mentioned previously.
The only difference is the interrruption of the character transfer as soon as the signal TU20 and FINU, which is stored in FILA arrives from central processor.
On its turn, FILA goes to stop the generation of TE 20.

6.2.8.22. Mechanism of self-correction in P.M.

6.2.8.22.1. Track in alert

The boards SOGU check that the signals arriving from tape are above a certain threshold.
The complete absence or the reduction of the signal is indicated by the positive value of the outputs (SEA0 - SEA8); this value shows with a delay of about three characters from the last signal which was above the threshold.
These nine signals are stored in the flip-flop ALA0 - ALA8.
The signals show on all the tracks at the beginning of the block reading, ALOR is formed and after four characters RESA fails.

The function of RESA is to reset the flip-flops ALA0 - 8. If, while reading, the width of a signal drops below the threshold, one of the ALA is set: the "alert" conditions are thus started.
Meanwhile the reading goes on normally, but ORTE is set.
If at this point a check error shows in LU, it is assumed, that the error concerns the track in alert; a TINU shows which goes to set both ORNO and the flip-flop of the register NU, corresponding to the ALAX set and goes to reset the deskewing buffer, thus "blinding" the wrong track.
Therefore the transfer network from LU to BA will generate, in that track some bits zero if the character has the correct check and some bits one if there is ERLU.

6.2.8.22.2. Two tracks in alert

Should there be two or more tracks in alert, this indication is given by the logic network which ends up in DUPIN: until, no errors show, everything proceed normally otherwise UNCO and FAFI are set.
Through the CA counter (refer to para 6.2.8.3.) UNCO counts a time equal to 28 characters; when it fails the flip-flop EGO3 is set. But, if UNCO fails when all the reading signals are over, EGO3 is not given, as it is assumed that the double alert showed during the post-amble.
This is also valid if a track was self-correcting (ORNO) and subsequently another one goes in alert, so that it is not possible to detect the origin of the errors and the block results to be not correctable.
With FAFI meanwhile, the characters transfer to central processor was stopped.
This mechanism of self-correction and error signal is obviously stopped during the unitary blocks, which though introduce a special characteristics: as there are some tracks which never come out from the alert, RESA never fails and therefore it is not possible to decode the tracks occupation to detected the T.M. (refer to para 6.2.8.18.). The signal RUDI then shows up to replace the functions of RESA.

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6.2.8.23. EGOL - NU 10

The reading of a block, self-correcting a track, implies not to recognize the key of post-amble beginning (refer to para 6.2.8.12.), as the characters "all bits zero" are corrected. Though, lacking the signal of end from C.P.U., the controller transfers also the post-amble; there is, though, the possibility to give this signal by means of EGOLT.
As soon as the permission to read is given, the EGOL flip-flop is set, which will fail either recognizing the post-amble key, or recognizing a character of "all bits one" present in BA, if the end from C.P.U. has already arrived and if the self-correction is under way; a third reason is the arrival of TU20 - FINU immediately after the TE20 of the "all bits one" but before the next TE20: this means that the central processor has not accepted the character and it has given the end with a certain delay. Therefore, if EGOL, at the end of the reading, is still high, it means that the post-amble has been transferred at least in part; software will be able to eliminate it, performing a backward search until it finds the character "all bits one".
Though, at the end of the flow of the signals from tape handler, the circuits are energized for a certain period of time before SOGU signals it; there is, therefore, the possibility that some bits one were transferred in the deskewing buffer, to form a character with all bits one.
In addition, there might be three of these characters.
Also this inconvenience must be signaled, to instruct software to skip four cahracters before looking for the post-amble key.
For this purpose, use is made of the flip-flops NU10 and BABA, which are set by the recognition of a "all bits one" character, if CPU has not yet sent the end.
In addition, NU10 is also set by the reset of EGOL.
The function of NU10 is to make the register CA count the three characters.
If at the end of the counting UNCO did not show, NU10 fails, again. If, instead, it stays up, it means that the "all bits one" character was at the end of the post-amble and therefore it was false.

The things get more conmplicated if the end from C.P.U. arrives during the post-amble transfer or even in the middle of two false "all bits one" characters.
The first case would reset EGOL in the wrong manner ,but would set NU10: so the EGOLT interface signal occurs with the OR of the two flip-flops.
The second case is solved by BABA which distinguishes: if the set of NU10 was performed by a "all bits one" character transferred to CPU, it stays high, otherwise it is low,so the NU10T interface signal is given by the AND of NU10 and BABA.

6.2.8.24. Pre-amble checks

6.2.8.24.1. UNIN

At the end of the UNSE time (28 nominal characters) UNIN is triggered and, on its turn, it triggers again the CA counter. When four characters have been counted, RUNI shows which re - sets UNIN and goes to test if there is any track already preset in the desckewing buffer.
In this case EG04, is set, as there is one of the PHOS out of step.

6.2.8.24.2. VEIN (refer to timing 14323198 sheet 13)

At a certain moment the bits one pre-setting the deskewing , buffer (refer to para 6.2.8.6.) begin to arrive.
If, though, a track is in alert, there is the risk not to receive the corresponding bit one: therefore, VEIN intervenes, which is set with ORIN; it makes the CA counter evolve for four characters and, at the end, it goes to preset the whole deskewing buffer, confirming also the already preset tracks. Naturally this device does not work with the T.M. blocks and with the burst.

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6.2.8.24.3. Noise block in P.M.

A noise block starts all the mechanism of the normal reading, but if its period is below the one of UNSE (28 chrts) the flip-flop BOLE is one of UNSE (28 chrts) the flip-flop BOLE is not set so the tape goes on until it finds the true block which will synchronize again the controller and will be read normally.

6.2.8.25. Transfer speed limit (refer to timing 14323198 sheet 21)

If a track is delayed a lot, the deskewing buffer is filled up to the limit of its capacities, and the extraction of the character occurs with the rythm imposed by the most delayed track.
If, though, at a certain point this track goes in alert and subsequently it is removed and rigenerated, it no more conditions the characters extraction, which tries to be triggered at the speed imposed by the electronic recycle.
Then the recycle delays URVA and UNTI intervene which condition the TULU and subsequently limit the repetition speeed of the TE 20.
Therefore, the excessive filling out of the buffer is recovered within a few characters (from about 4 to 30, in function of the tape speed and skew).

6.2.8.26. Check of overflow in deskewing buffer
(refer to timing 14323198 sheet 17)

This check is done indirectly.
If one of the tracks is delayed at the maximun allowed, and at a certain point the delay increases more. the interval between two extractions (TULU) is above the internal time of the one shot circuit UNOV. So UNOV fails, it impose the FINE to Central Processor with subsequent issue of the IS1 and sets EGO2 which gives SEGE.
UNOV has no effect on SEGE if the reading is already over.
Therefore, unless the end from central processor has arrived, it is exploited to generate the signal FINE in all the blocks, as soon as FAFI shows. This to make the central processor gain the time that the controller uses to read the part of the

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block not to be transferred.

6.2.8.27. EG03

As already explained in para 6.2.8.22. there are some conditions which make a block wrong and not correctable.
The main device of this check is UNCO.
It is set during BOLE if several tracks are in alert one of which is in self-correction; or during the recording check, a track goes to alert. These sets are inhibited during the unitary blocks. But UNCO is set, if during the recording of the unitary block one of the tracks which should be recorded goes in alert.
When UNCO fails, if the signal has not disappeared on all the tracks, i.e. the block is not over, EG03 and subsequently SEGE show.
In addition, if during the synchronization phase of the registration check reading, after the first four characters of the block, an alert shows on any track for normal recording or on one of the tracks of the T.M. recording, then there is an additional set of EG03, through SEE3.

6.2.8.28. EG04

This flip-flop, beside storing the error described at para 6.2.8.24.1., is set, if at the end of the block the reading was not over neither for the normal recognition of the postamble key, nor because of a clear impossibility to read the block correctly.

6.2.8.29. EG01

This flip-flop stores the detection of a parity error of the characters.
The devices which check the characters are the check network ERBA and ERLU which check the contents of BA and LU, registers in which the characters are present expanded to nine bits and therefore always with on odd parity check bit.

In particular with ERLU the parity in recording and with ERBA in reading is checked.
The pulses which check the errors are TIDA for the P.M., i.e. pulses symptomatic of the presence information character ; while for NRZ1 it is the TEME conditioned by CECO, i.e. with the exception of the service characters CRC and LRC.

6.2.8.30. EGOO

Also this flip-flop controls the parity in BA, but only relatively to the characters and to the codes of the commands arriving from central processor. It goes to the interface through the signal ERCA.

6.2.8.31. ESIN

This flip-flop stores an error in the pulse exchange during trasmission or during reception from central processor.
With the TU30 and TE20, in reading, or with the TE 10 and TU 20 in recording, the flip-flop TETU is set and reset alternatively.
If a TU30 or a TE 10 find the TETU high, ESIN is set, which goes to the interface through ERCA.

6.2.8.32. NRZ1 noise block

A single flux transition present in the interblock is considered a noise.
With the first TULU the flip-flop VIBO is set going to avoid the output of the pulse TO18 (refer to para 6.2.8.17).
In this way, an irregular flux transition is not considered as a real block and therefore it does not stop the tape in the wrong way.
The following character (ORBI), both if it is a service character of the unitary block, or the first block to be really read, reset VIBO.
After this, the reading proceeds normally.
This control is not performed in recording.

6.2.8.33 EG05

This flip-flop stores two types of error, and it is typical of the NRZ1. It is set if during recording,the reading signals go below a certain threshold (ORES).
In addition,it is set if, at the end of the reading (T018), there is an LRC errror. This check uses nine flip-flops (LO register), which form nine elementary binary counters, which switch at every bit one which shows on the corresponding track.
Also the CRC and the LRC make the flip-flops evolve, which at the end must be all in reset.

In order to integrate possible output pulse rings of the reading channel, the auxiliary register AU is used, whose flip-flops are set by bit 1 and are reset by the end of the gate.

6.2.8. 34. EG06

This flip-flop is the CRC error storage, i.e. at the end of the block reading, T018 goes to test the registers SA in reading and SE in recording which must be completely reset.

6.2.8.34.1. SA performance in reading (refer timing 14323198 sheets 26,27)

The evolution procedures of SA are the same as those described in para. 6.2.7.3.5., with the only difference that in BA there are, instead of the characters from C.P.U. those from tape handler.
Therefore the timings will have a different source.
Phase α (TA21) is driven by TEME (refer to para 6.2.8.14.) conditioned by NOCO, in order to neglect the character LRC in the reverse movement.
Phase β (TA22) is driven by TULU if there is "BUCO" and if NOCO is not present: therefore in the final part of the block reading in the two directions of the movement.
In addition, NOCE defines that, in the movement forward, the valid "gap" is the second.
The final phase (TA23) is driven by the last TULU enabled by INSA.
As also the CRC is introduced in SA, the whole register goes back to zero.

S.T.

6.2.8.34.2. SE performance in recording

During the recording instruction, the SA register is used to calculate the CRC: therefore, for the check, SE is used, which processes, with the same procedures of SA, the characters which arrive in LU.
As SE includes also the CRC, at the end it is completely reset.
The comparison, bit by bit, between LU and SE is as the one between BA and SA in forward movement.
Phase α (T021) is driven by TEME.
Phase β (T002) is driven by TULU until INSA shows.
The final phase (T003) is driven by the last TULU enabled by INSA.

6.2.8.35. Recording check reading

This reading is done to allow all the checks, planned for by normal reading, of the blocks during recording.
Therefore the characters will follow the normal flows with the exception of their passage to the BA register.
In addition, as the tape stop mechanism is energized by the failure of BOLE, there is a reference point which is the same for the recording and reading instruction.
In NRZ1, as BORO cannot switch (between VATU and BIOR), as it is busy with recording, it will be in condition to work to count the intervals between characters only at the end of PREA.
Also SIDA will not be able to be set until that moment.

6.2.8.36. EG07 (refer to timing 14323198 sheet 25)

During the recording reading, in NRZ1, a device to check the characters separation, limited to high density, intervenes.
With the recycle pulse of the delay line B006 (refer to para 6.2.8.15.) a one-shot circuit (NOBO) is set, which, in its turn, drives another one-shot circuit (NOBI).
If during NOBI a bit shows on any track (ORBI), EG07 is set.

S.I.

6.2.9. Back-Space instruction

This instruction is used to have a back run under the head, without any proccessing with only purpose to stop the reading head on the interblock at a greater distance than the one of the normal reading instruction.
It is done when a block is to be read, having more time available to prepare the reading circuits.
Therefore the positioning instruction has an initial phase as the reading (para 6.2.8.1.).
There is the flow of data up to BA, but there are neither TE20 nor end signal.
The check of odd parity (EG01), of incorrectable block (EG03), of CRC (EG06) are not performed.
When BOLE fails, the USTO time (para 6.2.5.4.7.) starts, which though is not reset with REUS.
To the contrary, REUS makes another time (USTI) start, at the end of which both USTI and USTO fail.
So, as the delay to the stop has been lengthened, the reading head will be farther on in the interblock.
The following reading, which will have direction of movement opposite to the jump, will be done with a higher reliability.

6.2.10. Reading with self-corrections in NRZ1

(refer to timing 14323198 sheets 35, 36)

This instruction is used to read a block, rigenerating a track which had been recognized as defective.
It is done in four pahse: reading of the block, jumping in opposite direction, search for the possible wrong track, reading again the block eventually rigenerating the wrong track.

6.2.10.1. First reading

The command of reading with self-correction is stored in AUNA and the controller proceeds to read the block, but without performing transfers to C.P.U. Therefore the SA register evolves normally and returns all to zero only if there are no errors.

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Meanwhile, also the register SE has evolved, but it is timed differently from what described in para 6.2.8.34.2., and with characters which are not the ones of the block, even if they are in an equal number.
In particular, these characters will be: all bits zero if the corresponding character of the block has a correct parity check; characters with binary order 1 if there is an error.
This is achieved through the P041 gate, which simulates bit 1 in comparison with the stage SE06 and trasferred in SE07 , if there is an error in LU and indication of first pass (AUCO).
As far as the SE timing is concerned, phase α (T021) is driven by TEME and conditioned by SIDA for the forward movement and NOLO for the reverse movement.
This in order to avoid evolutions with false characters in LU.
Phase β is driven by TULU until INSA shows.
The final inversion does not occur.
At the end of the reading, the stop phase starts, not freeing the controller as there is still the AUNA condition.
UPIP, failing, generates a TOVA and subsequently TIVA.

6.2.10.2. Reverse Back-space

TOVA reverses the AVAN flip-flop and sets PONA; therefore TIVA will send an instruction to jump in the opposite sense.
To be noted that the initial reset of SE and SA, whose content will be used in the third phase, is not issued.
The jumping ends without freeing the controller, setting LENA and generating another TOVA and TIVA.

6.2.10.3. Search for the possible wrong track

TOVA has again reversed AVAN and sent the instruction of real reading of the block; during the UVAL time count the track search is performed.
When the pulse RUVO shows, if SA is not all at zero, TONU shows which on its turn sets ORNO and the first cell of the register NU.
NU is a register consisting of ten cells, nine of which are connected as "shift registers".
In the forward movement of the tape, the movement occurs from NU00 to NU08 and with TONU, NU00 is set again.
In the reverse movement, the sliding occurs from NU08 towars NU00 and W72, TONU, NU00 is set again.
In the reverse movement, the sliding occurs from NU08 towars NU00 and with TONU, NU08 is set again.
We will speak further on about NU09.
TONU performs another check: if the comparison between SE and SA; done with the exclusive OR NA18, shows a difference, the flip-flop BACO is reset.
The next TORI will then be in condition to set the flip-flop PASA, and to cause a β phase of the register SA (refer to para 6.2.7.3.5.).
Simultaneously, it will go to test whether SA has become equal to SE; it is obvious that the first time it will find the situation unchanged.
The subsequent TORO, through INCO and AVCO, makes NU move a step forward: meanwhile a phase α occurs in SA.
Another TORI shows which causes another phase β, but also a testing of the comparison between SE and SA.
The mechanism goes on until TORI finds the equality.
It sets then BACO, PASA fails and the number of the track to be regenerated is stored in NU register.
In this phase the register SA does not feel the inputs, because they are blocked by the flip-flop SOLA set by TONU.
At the end of the search of the track a REOV will show which will reset the registers SE, SA and the flip-flop SOLA.
There are three special cases: TONU does not show therefore the self-correction is not needed and does not occur, TONU does not reset BACO, it means that the track to be corrected

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is the first (NU00 or NU08); there is never an equal comparison between SE and SA, the flip-flop NU09 is set which means block which cannot be corrected, ORNO fails and BACO is set.

6.2.10.4. Self-corrected reading

This reading occurs with the normal procedures, transfers the characters to the CPU and checks again the CRC.
The self-correction occurs on the network of transfer from LU to BA, and in particular on the cell sensitized by the NU remained set.
Every time a check error occurs in LU the validated cell inverts the importance of the corresponding bit.
The TO 18 will reset finally AUNA and will allow the freeing of the controller.

6.2.11. Other instructions

There are some commands which, even if they do not occupy the controller have a reflected effort on its pre-setting.

6.2.11.1. Set density

The four commands: "set high, intermediate, low density" and "set phase modulation" modify the T2 interface condition IM01 and IM02.
The decodings of these signals generate the machine conditions ALDE, MEDE, BADE and VADE i.e. 800, 556, 200, 1600 bpi. VADE shows at the 100 interface through NU30T.

6.2.11.2. Channel change

This command is usable only if the controller is connected to tape handlers provided with double electronics and therefore can be driven by two controllers in overlapping.

6.2.12. Additional electronics for failure diagnosis

The failures diagnosis uses a device to create some states which preset some performance procedures for the controller, different from the normal ones.
This device is completed with some gates, forcings on certain points of the machine and some Exclusive OR networks.
In addition, three special commands "clear", "count", "perform" are planned to pre-set and perform the tests.

6.2.12.1. Commands decoding

The three codes are recognized by the gates ESEG, DACI and DACE. They cause SECA (CAPE).
The TU20, accompanying them, does not store them in BA, but it stores the "perform" in ESDI, while the "count" and "clear" pulses go immediately into effect.

6.2.12.2. Status register (refer to timing 14323198 sheet 38)

It consists of the serial counter "CONX" formed by four cells.
It moves as many steps as the commands of "count" which it receives.
Its decoding shows the states in which the diagnostics operates.
The decoded states are DU01, 2,3,4,5,6,7,8 and 9; they have a value only after the "perform" command.

6.2.12.3. Status 1 (refer to 14323198 sheet 41)

It is generated by a counting of the CONX register.
In this status, the TU22 of the "perform" which follows, sets MEMO and then MEMA. In this way, any other following command is stored in BA, but it always gives CAPE and is not performed.
If transfer is made to another status, the next "perform" resets MEMO.
After 1 usec, also MEMA fails, generating a TU22 which will perform the command present in BA.
MEMA shows to the 100 interface through NU20T.

6.2.12.4. Status 2 (Pseudo-recording)

It is generated by to countings of the CONX register.
The TE30 giving indication of having received the "perform " causes a request of data from central processor which normally remains without effect.
If subsequently a command is sent of the type which plans for the flow of data from central processor, the TE30, indicating reception, generates a TU 10, the characters which arrive to controller are stored in BA with TU19 and with the related TU26 the check bit (PAGI) is inverted.
To be noted that the tape does not move as with DU02 the B.O.T. condition (BOTAU) is simulated.

6.2.12.5. Status 3

It is generated by three countings of the CONX register.
It serves for the pseudo-reading of the deskewing buffer.
A normal reading of a block recorded on tape is done, introducing a change in the device to empty the deskewing buffer (refer to para 6.2.8.7.2.) .
I.e. the coincidences do not cause the TULU, but the first extraction is done with the edge of the AND of the pre-setting of the shift-registers, and the following ones occur with the recycle of URNA and UNTI, i.e. at the highest speed.
In this case the signal of FINE from controller is inhibited.

6.2.12.6. States 4 and 5 (Pseudo-reading).

They are defined from 4 and 5 countings of the registers CONX.
Their presence, validated by ESDI brings on the information channel of the interface towards C.P.U. some signals which are the result of Exclusive OR's between various signals of the controller. These comparisons are done with some REDI boards and are AEFE-GEFE for the pseudo 4, AEFO-GEFO for the pseudo 5, with which RE 12 may also be tested through LEFO to go back to the speed for which the controller is preset.

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These pseudo-readings are done in various moments of the machine performance, and the character they supply forms a sympton of the signals conditions.
In order not to have the Exclusive OR of output towards interface disturb the readings, it is forced to zero by the flip-flops MUMO-MUM7, which are set by SEMO and go to the AIF01 - LIF01 gates.
For the accompanying triggers, a TE20 is generated with the same TU10 sent from central processor.
Also in this case the end from controller is inhibited.
If though the command "perform" occurs during the initial phase of the recording instruction and it is compiled to send characters to the controller, there are no more pseudo readings but the controller requires a character through the normal way (TE 10), sets RETU and resets PREA.
The next TE10 sets FILA simulating the end from C.P.U.
After this, some pseudo - readings may be done with another, "perform" with transfer to CPU.

6.2.12.7. States 6 and 7

They are defined by 6 and 7 countings of the register CONX.
Their function is very similar to the one of states 4 and 5.
The only difference is that the MUM are not set and the REDI are not validated.
So the contents of BA or MA may be pseudo-read.

6.2.12.8. Status 8 (refer to timing 14323198 sheet 39)

It is defined by 8 countings of the CONX register.
It serves to create the interruptions of flux transitions on tape, during the recording of a block on all the tracks.
This status enables a mechanism which intervenes during the data transmission to tape handler.
The arrival from central processor of a character with code "binary zero" is interpreted as key.
The TU20 of the subsequent character, which will be a "all bits 1" sets the flip-flop SERO.
A second TU20, which accompanies a character "all bits 0", resets SERO and sets SERI.
The TE10 which follows generates the pulse SUMA which makes.

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the counter CONX move a step forward and therefore it moves it to the status 9; it resets SERI and with SUMO it sets all the nine MUMO - 8.
This register MUM goes to block the information output commands both towards central processor and towards tape handler, forcing them at logic level zero.
To be noted that all this occurs in a moment in which BA and MA are different and therefore no phase transition was under way.
In addition, the last recording which was of all bits 1 has left the flow direction equal to the one of the interblock.
The recording instruction and the trigger exchange continue, without having transitions on the tape.
In order to start again the recording another key (a character zero) must be sent which presets again DASE.
The next TU20 accompanies a "all bits 1" which sets SERO.
The second TU20 accompanies a "all bits 0" which resets SERO and sets SERI.
The subsequent TE 10 generates SUMA but not SUMO.
The SUMA transfers the contents of BA in MUM: if the character was all zeroes, it activates again all the tracks.
The first character recorded will be a "datum" and will be a "all bits 0", therefore it prepares the recording of a preamble. In fact, this mechanism is used to generate special blocks.

6.2.12.9. Status 9 (refer to timing 14323198 sheet 40)

It is defined by nine countings of the CONX register.
It serves to create the interruption of transitions on tape, on a variable number of tracks, during a recording instruction.
The arrival of a character zero is interpreted as key and is decoded in DASE.
The next TU 20, which accompanies a freeing character, sets SERO.
It is preferable that the character has some bits 0 in correspondence with the tracks to be removed.

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The second TU20 accompanies a character which has bit 1 only in the tracks to be removed.
This pulse resets SERO and sets SERI.
The subsequent TE10 generates SUMA which transfers BA in MUM.
The flip-flops of MUM which are set, block the information output channel.
The same mecchanism activates again the tracks, setting a freeing character, preferably with bit 1 in correspondence of the removed tracks and as activating character one with bits 0 in the tracks to be activated again and eventually some bits 1 to remove other tracks.

S.T.

6.3. Special circuits

Two new boards of the standard SCL1 were born with this controller.
Some boards of the reading channel are also inserted in the controller.

6.3.1. TORE Ø G board

It is similar to the previous TORE Ø A with the only difference of not having the ouput adjustment resistors.

6.3.2. UNRA Ø M board

It is similar to the previous UNRA Ø B with the only difference of having transistors of a different type to allow on internal time ranging from 4 to 20 μsec.

6.3.3. P.M. reading channel boards

They are floowing:
RIFI, RARI, SOGU, ZEDE, VUSO, PHOS
described in the specifications No. 300041190.

6.3.4. NRZ1 reading channel boards

They are the following:
ALFIB, PIDE, DOSO, TESO, SCAR.
They are described in the following documents: drawing No. 300040090 and No. 300041030.

S.T.

6.4. Power supplies, performance and distribution sequences

The physical unit presents only one a.c. distribution panel connected with the rest of the system. Therefore the main breaker must be set on "ON".
To supply the voltage to the tape handlers the derived breaker must be set on "ON".

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7.0. RELIABILITY (tentative data)

For the parameters definition, reference should be made to the publication No. 300140000.
The reliability parameters given below are referred to the time during which the controller is supplied with the d.c. voltage and normally ventilated.

7.1. Incidents and errors

7.2. Life of the product and media (tentative data)

Life of the product 25.000 hrs

7.3. Reliability and Maintainability (tentative data)

MTBF 1200 hrs
MTTR (supplied only for MTS)

8. TEST PROCEDURES

8.1. Off-Line tests and Adjustments

The wirings and the boards must be tested according to their related procedures.

8.1.1. One-shot circuits

To adjust the one-shot circuit time, the indications given in the following paragraphs must be followed.
For "measure tolerance" we mean, further on, all the incertitudes in adjustment due to:

- measure device incentitude
- reading error

The values and the types of capacitors to be assembled on the one-shot circuit boards and the values of the times to be obtained are given in the "One-shot circuits times lists No. 143240820, 143240840, 143240860; 143240880, 143240790, 143240780, 143241130.

8.1.1.1. UNIV one-shot circuits

The given times must be obtained with the measurement tolerance. The measurement tolerance must not be above ± 5%.

8.1.1.2. UNRA one-shot circuits

The given times must be reached within the tolerances indicated in the list with the possible addition of a second capacitor whose value must be chosen at the moment of the adjustment.
The tolerances given in the list are not inclusive of the measurement tolerance.
The measurement tolerance must not be above ± 5%

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8.1.1.3. UNAS one-shot circuits

The UNAS type one-shot circuits: NOBO and NOB1, may be adjusted with the same procedure as for the UNIV one-shot circuits.

8.1.2. FACI boards

A jumper board as described on the documents 143447170, 143441780, 14344719 must also be set.

8.1.3. Delay line

The delay line is divided in three boards.
The adjustment must be done on a group of three boards.
The tappings to be done are three and they are performed with strappings on the boards; the times refer to the leading edge of the input pulse.

D017 - pin 3 - 2nd board (C.38) - 1.950 nsec
D027 - pin 3 - 3rd board (C.39) - 2.850 nsec
D036 - pin 15 - 3rd board (C.39) - 3,500 nsec

REVISION 1 25.9.69

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Honeywell Information Systems Italia

SOTTOSISTEMA MTC 163/154/166/167/172/173 - MTH 163/166/172

INDICE DEL VOLUME 3

Questa pubblicazione è valida per i prodotti aventi i seguenti codici:
- vedi riferimento codici prodotto 4.809.2.000.1

Raccoglitore da 2", a 3 anelli

Finestra

Indice 4.809.2.004.2

Descrizione:

1 Sottosistema MTH 163-166-172 4.809.2.001.1
2 PDS MTC 163 ÷ 173 30004127
3 PDS MTS 160 40004131
4 PDS Piastrine lettura registrazione 30004119

Installazione:

1 Sottosistema MTC 163 ÷ 173 MTH 163 ÷ 172 4.809.0.001.

Manutenzione:

1 Sottosistema MTC 163 ÷ 173 MTH 163 ÷ 172 4.809.4.001.
2 MTH 163 ÷ 172 Procedure d'intervento 4.809.4.501.

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1.12.1970

Honeywell
Honeywell Information Systems Italia

MTC 163/164/166/167/172/173 - MTH 163/166/172 SUBSYSTEM

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(T.o.C.) VOLUME 3

This publication is applicable for those products having the following product codes:
. see product code reference 4.809.2.000.1

Binder 2", 3 ring

Title window

T.o.C. P.N. 4.809.2.004.2

Description:

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2 PDS MTC 163 to 173 30004127. /A
3 PDS MTS 160 40004131. /A
4 PDS MTH PWB's 30004119. /A

Installation:

1 MTC 163 to 173 4.809.0.001. /A

Maintenance:

1 MTC 163 to 173 - MTH 163 to 172 Subsystem 4.809.4.001. /A
2 MTH 163 to 172 - Troubleshooting aids 4.809.4.501. /A
Preventive maintenance Log 4.033.4.074. /A
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Parts 4.808.5.001.

1.12.1970

DESCRIPTION

1

GENERAL ELECTRIC
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MAGNETIC TAPE HANDLER

MTH 163 - 166 - 172

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8.2. On-line tests and adjustment

For these operations, the Controller must be assembled on a subsystem with at least one tape handler and must be set in operating conditions.

8.2.1. NRZ1 reading channel adjustment

Refer to Standard Adjustment Procedures of 7/9 tracks, 800 bpi - no. 3000400090.

8.2.2. PM reading channel adjustment

Refer to PM Standard Adjustment Procedures no.

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MTS 160
PRODUCT DESIGN SPECIFICATION
1° APPLIC.
CONT. SU FU. 1 FO. IV

CALLED DOCUMENTS

P.D.S. MTC 163 ÷ 173	No. 300041270
P.D.S. MTH 163 - 166 - 172	No. 300041110
Physical block diagram	No. 150436050
P.D.S. 100 interface	No. 300740110
P.D.S. Extended T2 Interface	No. 300740790

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Cod. 3896128 F

1. GENERAL CHARACTERISTICS

1.1. Foreword

This subsystem connects the MTC 163 ÷ 173 (refer to PDS NO. 300041270) with the MTH 163, 166, 172 (refer to P.D.S. No. 300041110).

1.2. General

This subsystem may process magnetic tapes with the following characteristics:

Packing	Phase Modulation	NRZ1	
1600 bpi	X		
800 bpi		X	X
556 bpi			X
200 bpi			X
	nine tracks		seven tracks

1.3. Physical configuration (refer to drawing No. 150436050)

The subsystem has, aligned to the right of the MTC, a number of "single capstan" tape handlers varying from 1 to 8.
These units may be with seven or nine tracks in any order.
These tape handlers must all have te same trailing speed.

OS.T.

1.4. Electric configuration

1.4.1. Signals distribution

The subsystem is connected, through cables leaving from the MTC, to the interface 100.
Within the subsystem a "bar type" connection connects the controller to the units.

1.4.2. D.C. Voltages

The subsystem takes from the centralized power supply of the system a voltage of +20V to supply the controller.
The electronics of the units uses an internal power supply.

1.4.3. A.C. voltages

An A.C. of 220 V three-phase is brought to the subsystem to supply the tape handlers.
In the MTC there is an A.C. distribution panel, connected with the system, to which the units are connected by means of a bar connection.
The maximun current absorbed is 27A.
A priviledged A.C. voltage is taken from the system to supply the controller fan.

S.T.

1.5. Mechanical configuration

The subsystem dimensions are:

- height 1680 mm
- depth 700 mm
- length 980 mm +768 mm . x No. of units.

The unit height including the panel goes to 1820 mm.

2. REQUIRED ENVIRONMENT CONDITIONS

For these data, refer to what mentioned in the P.D.S. of the individaul "physical units".

3. OPTIONS LIST

For these data refer to what mentioned in the P.D.S. of the individual "physical units".

4. GENERAL PROGRAMMING CHARACTERISTICS

The subsystem plans, to have the 100 interface towards the central processor and, within the tape handlers, the extended T2 interface.
For further details refer to the P.D.S. of the individual "physical units".

S.T.

5. OPERATING CHARACTERISTICS OF MAINTENANCE

5.1. Operating panel

The subsystem has not a panel of its own.
Each tape handler has its own panel.

5.2. Maintenance console

The subsystems is not provided with a maintenance panel.
In the controller, there are some boards with lamps giving the most important indications.
For the tape handlers refer to the specifications.

5.3. Failures diagnosis

The diagnostics uses special programs (drawing No,

5.4. Alert conditions

The controller fan is provided with protections for no ventilation, whose intervention turns the whole system off.

S.T.

6. OPERATIONS THEORY

The logic view of the subsystem must be divided into the various composing physical units.

6.1. Power supplies performance and distribution sequences

The main breaker must be set on "ON" to power-on the subsystem: with this it is possible to turn the whole system "ON".
The derived breaker must be set on "ON" to power-on the units , and then the panel of each unit must be adjusted.

S.T.

7. RELIABILITY (tentative data)

For the parameters definitions, reference should be made to the pubblications No. 300140000.
The reliability parameters given below are referred to the time during which the controller is supplied with the d.c. voltage and normally ventilated.

7.1. Incidents and errors (tentative data)

Reading recoverable errors	ER	10^{-8}	bit^{-1}
Reading unrecoverable errors	ER	10^{-10}	bit^{-1}
Writing errors	ER	10^{-7}	bit^{-1}

7.2. Life of the product and the media (tentative data)

Product life (see PDS of MTH 163-166 & MTC 163-173)
Media life l(see PDS of MTH 163-166)

7.3. Reliability and Maintainability (tentative data)

MTC 163÷173	MTBF	1200 hrs
MTH 163-166	MTBF	800 hrs
MTS 160	MTTR	2 hrs (subsystem with 4 MTH)

S.T.

8. TEST PROCEDURES

The testing must be done on physical units already individually tested, verifying with the diagnostic program at least the most remote unit.

S.T.

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1600 PM/NRZ Tapes Circuits
1° APPLIC. GUN 150 - GUN 170
CONT. SU FO. II FO. I

1600 PM/NRZ TAPES CIRCUITS

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1. READING

The read circuits of the 1600 PM/NRZ tapes standard have the purpose to amplify and process the signals arriving from the read head, before on every single tape handler then on the controller, until they reach the standard logic levels.

The peripheral reading consists of a part always present, common to phase modulation and to NRZ and of an optional part for the NRZ system.

This division is also present in the centralized part.

In the following description reference will be made to one read channel only; in reality, the channels are 7 or 9 depending on the standard used.

1.1. 1600 PM peripheral reading.

It consists of two boards:

PAMI and TRAL not differentiated for the speed.

PAMI is a linear amplifier which receives the signal from the head and amplifies it, with a gain adjustable by means of a potentiometer, to a value previonsly fixed, in order to balance the head tolerances and the variations of the signal amplitude due to the different speeds.

TRAL essentially consists of the power transmitter to drive the connection cable between the tape handler and the controller and of the selection of such transmitter as all the units are connected in parallel and they must be selected only one at a time.

During phase modulation performance, the PAMI signal enters directly in the TRAL which selects it.

S.T.

1.2. NRZ optional part of peripheral reading.

It consists of a single board: PARI, type A_0 if the tape handler has a speed of 18,75 "/sec, type A_2 if the speed is of 37,5 "/sec or 75 "/sec.

PARI contains a delay line which allows the vertical deskewing of the signals of the various tracks conpensating, in this way, the static skew of the head. This balance is planned only for the NRZ system as the deskewing of the characters read in the PM system is done logically by the controller.

The delays adjustment is done by means of jumpers while testing the tape handler.
Two selections allow to have one delay for the forward reading and another delay for the reverse reading. These selections occur only when the NRZ performance is selected.

In this case, the PAMI output signal is delayed by PARI and it enters the TRAL.
During PM performance, PARI, disselected, does not send signals to TRAL.

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1600 PM/NRZ Tapes Circuits

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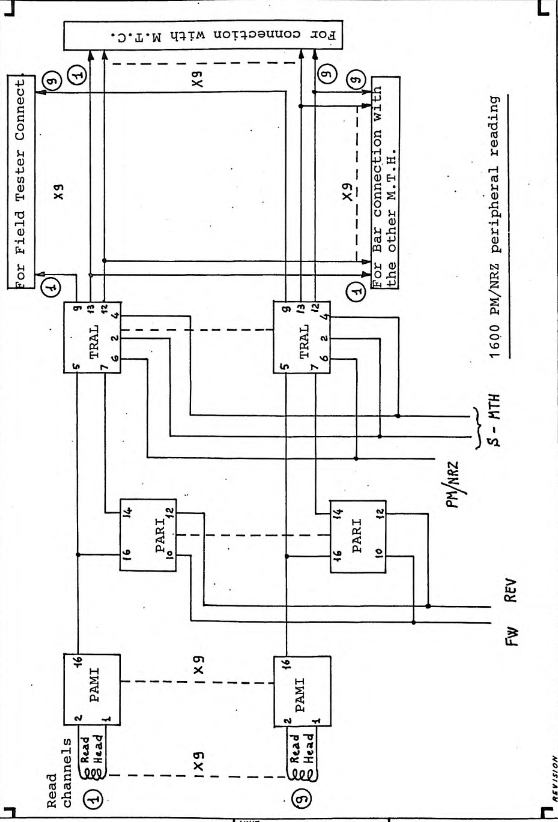

1600 PM/NRZ peripheral reading

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1.3. 1600 PM Centralized reading

The signals from the tape handler arrive through a cable to the controller and precisely to the receiver circuit RIFI (A_0 if the system has a speed of 18,75 "/sec, A_1 if 37,5 "/sec, A_2 if 75 "/sec); from this one the other chain circuits are reached:

- RARI (A_0 at 18,75 "/sec, A_1 at 37,5"/sec; A_2 at 75"/sec)
- ZEDE indifferentiated for the speed
- PHOS (A_0 at 18,75"/sec, A_1 at 37,5"/sec, A_2 at 75"/sec)
- SOGU (A_0 at 18,75"/sec, A_1 at 37,5"/sec, A_2 at 75"/sec)
- VUSO indifferentiated for the speed and the same for all the channels.

1.3.1. The RIFI has many tasks which are:

a. Supply the correct termination impedence to the signals cable.

b. Amplify in a differential mode the read signals to supply a high "common mode rejection" to noises.

c. Supply an output for the NRZ signals compatible with the already existing circuits input.

d. Limit the band, in high and low frequency, to the PM signals to increase the signal to noise ratio.

e. Balance the smaller amplitude of the signal at 3200 with respect to the one at 1600 to use a single threshold for the envelope check.

f. Increase further the ratio between the signal at 3200 and 1600.

1.3.2. RARI provides to re-shape the signal, balanced in amplitude by RIFI, with a circuit for the forward movement and a circuit for the reverse movement suitably selected; in addition, it performs a first limit of the signal in the surroundings of zero.

1.3.3. ZEDE, by means of subsequent amplifications and limits, squares the signal in the surroundings of zero and, in correspondence respectively with the positive and negative edges of this wave form, issues some pulses at the two outputs.

1.3.4. PHOS is an oscillator producing pulses with a period equal to the mean semi-period of the data pulses from tape, to which they stay connected in phase complying, within large limits, with the frequency and speed variations.

Its purpose is to balance the long term speed variations and to allow the creation of a discrimination gate between "1" and "0" not influenced by the "crowding".

1.3.5. SOGU is driven by the signal balanced in by RIFI and checks its envelope supplying a signal at logic level if this envelope goes below a determined threshold level.

1.3.6. VUSO supplies to SOGU's the threshold level to which to make the envelope check, higher in writing than in reading, to margin the signal.

The connection of the centralized circuits of the 1600 part is described in drawing N. 2 page 6.

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1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 – GUN 170

CONT SU FO. 7 FO 6

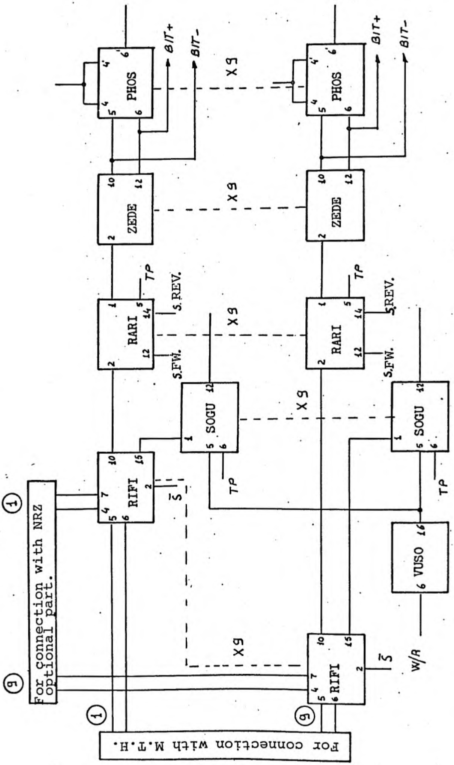

fig 2

1600 PM CENTRALIZED READING

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1.4. NRZ optional part of centralized reading.

For the description of this part refer to the following documents:

- Characteristics of the 7-9 tracks 800 bit/inch standard drawing N. 300040090;
- Characteristics of the boards PARS AO-BO/ALFI BO - B1 - B2/PIDE AO of the 7-9 track 800 bit/inch standard N. 300041030.

The only comment is that in the connection with GUN 170 the use of the ALFI B is compulsory as the signal sent to that board, in this type of GUN, has a amplitude which is less than the one present in the systems with NRZ only and only the type B of ALFI is able to balance this signal.

The assembly of the NRZ optional part can be seen in drawing N. 3 on page 8.

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1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 - GUN 170

CONT SU FO 9 FO 8

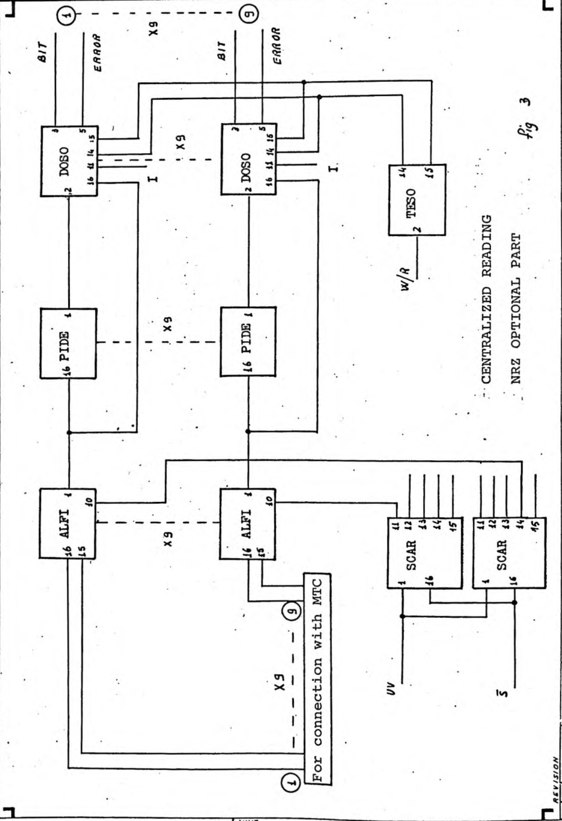

fig 3

CENTRALIZED READING

NRZ OPTIONAL PART

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CONT SU FO. 9 FO. 8

2. WRITING

The write system is the one at fictitious central connection.
The write circuits have the purpuse to bring the information to be written on tape, from the logic levels to signals compatible with the write head.

These circuits are physically located on peripherals, i.e. on every tape handler; therefore the interface between unit and controller takes place at logic levels.

It consists of four boards:

- AMRU indifferentiated for the speed
- CADI H indifferentiated for the speed and single for 2 channels
- CADI F indifferentiated for the speed and single for Tape Handler
- URES B_0 if the speed is 18,75 "/sec
  B_1 if the is 37,5 "/sec
  B_2 if the speed is 75 "/sec

AMRU consists of two write current switches driven by a fip-flop which assures the simultaneous opening of the first and the closing of the other; there is, in addition, the possibility to open simultaneously the two switches through on inhibition input.

The CADI H board contains the resistors for the calibration of the write current for two tracks. It contains, in addition, a circuit common to the two tracks to vary this current; higher in the NRZ system, lower in the 1600 PM system.

The CADI F board contains, instead, the resistor which supplies the correct current value to the erase head.

URES is a one-shot circuit, with a very short recovery time, with a period adjustable by means of a potentiometer which allows to balance the static skew of the write head, deskewing the various tracks.

The assembly connection is described in drawing N. 4 page 10.

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1° APPLIC. GUN 150 - GUN 170

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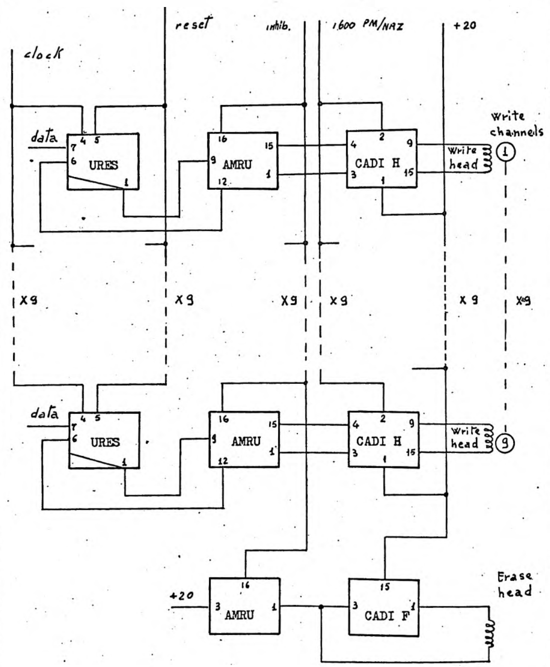

fig. 4

WRITING DIAGRAM

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CONT SU FO 11 FO 10

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3. READ CIRCUITS DESCRIPTION

3.1. PAMI

- drawing N° 015434010
- artwork N° 2334
- test N° 015740130
- electric diagram page 12

The circuit consists of two linear amplification stages in cascade.

R1 in parallel with the input impedence of the first stage, supplies the correct load of the head.

The first stage is formed by TR1 and has a gain of about 12.

Between the first and the second stage there is a potentiometer which allows to reduce the signal to the required value.

The polarization of the second stage is given by the Zener D1 through the potentiometer and the emitter follower TR2 to the amplifier transistor TR3. This is followed by an additional emitter-follower TR4 which provides to lower the output impedence.

The second stage gain is of about 18 bringing the maximum total gain of the whole circuit to about 220.

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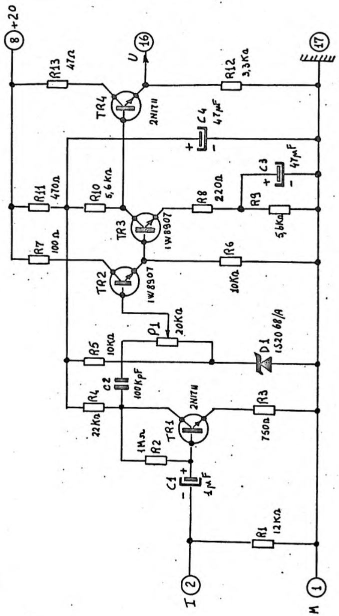
1600 PM/NRZ Tapes Circuits
1° APPLIC. GUN 150 - GUN 170
CONT SU FO. 13 FO 12

PAMI Electric diagram.



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CONT. SU FO. 13 FO. 12

Cod. 1896128 F

3.2. TRAL

- drawing n. 015433990
- artwork n. 2328
- test n. 015740160
- electric diagram page 14

The circuit may be divided in two parts:

3.2.1. Amplifier and density selector, formed by TR1, TR2, TR3.

TR1 is a linear amplifier which works, only if the system is working in phase modulation, through the selection of TR2 and brings the signal from the output value of the pre-amplifier to the value required for the interface.

The output resistor of this amplifier (R5) is also, through pin 7, resistor of output of the other two similar amplifiers set on the PARI board, should this optional part be present, thus forming a group of three amplifiers, with a single load resistor, out of which only one must be selected every time.

The signal of this amplifier is also sent to the field-tester for the adjustment through the emitter-follower TR3.

3.2.2. Transmitter and unit selector , consisting of TR4, TR5, TR6, TR7.

The signal arriving from TR3 passes through two subsequent emitter-followers, TR4 and TR7, which allow to bring the output impedence to a value of very few ohms.

TR4 is a transistor PNP and TR7 is NPN to have a balance in the thermal variation voltage droppings.

The resistors on the collector of TR7 limit its dissipation.

The signal transmission occurs on two leads: one starting from the emitter of TR7 and the return lead from the collector of TR6; this last one is a switch which, in saturation, allows the closing of the signal and, when off, with the simultaneous saturation of TR5, makes the line completely free.

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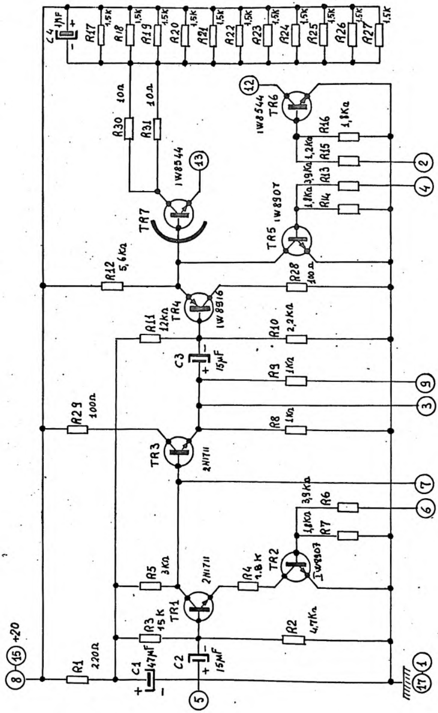
1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 – GUN 170

CONT SU FO. 15 FO. 14

TRAL Electric diagram



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CONT SU FO 15 FO 14

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3.3. PARI AO - PARI A2

PARI AO - drawing n. 015434330
- artwork n. 2337
- test n. 015740140
- electric diagram page 16

PARI A2 - drawing n. 015434320
- artwork n. 2336
- test n. 015740150
- electric diagram page 17.

In the NRZ performance, the signal of the PAMI is sent to TRAL through PARI, it enters therefore the delay line which is driven and ended with its characteristic impedence.

In PARI A2 the maximum delay is of 5 µs and it is obtained with a single line; in PARI AO the maximum delay is of 10 µs and it is obtained putting in series two 5 µs lines.

To balance the reduction introduced by the resistor of the delay line (variable therefore with the delay chosen), the two channels, forward and reverse, are suitably reduced by means of breakers formed by potentiometers P1 and P2 and re - spectively by resistors R5 and R6.

The signal present at the P1 and P2 wipers enters the amplifiers TR1 and TR2 only one of which is selected respectively by TR3 or TR4. The output is in common and the load resistor is the R5 of the TRAL.

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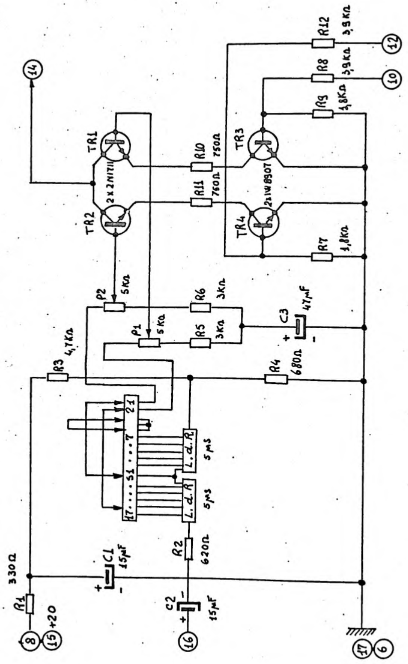
1° APPLIC. GUN 150 – GUN 170

CONT SU FO 17 FO 16

PARI AO Electric Diagram



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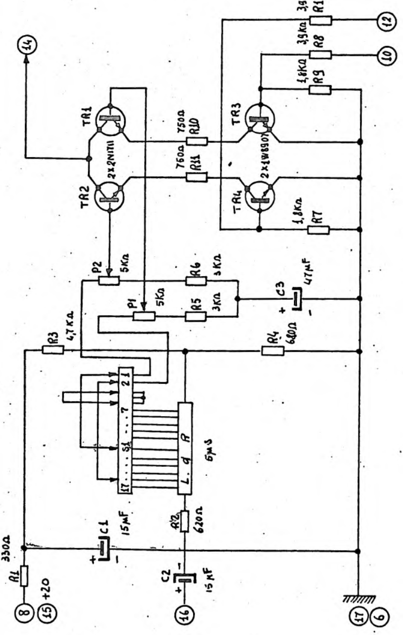
1° APPLIC. GUN 150 - GUN 170

CONT. SU FC. 18 FO 17

PARI A2 Electric Diagram



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Cod. 3896128 F

3.4. RIFI AO - A1 - A2.

- drawing n. 015434370
- artwork n. 2408
- test n. 015740180
- electric diagram page 20

RIFI con be divided in six parts:

3.4.1. Resistor of cable termination

As the frequencies of the signals sent by the units to the controller, above all at PM and with 75 "/sec unit, are rather high, it is necessary that the transmission line is loaded with its characteristic impedence; for the cable used, type CBT 12, this impedence is of 82 Ω and the termination is realized with R2 which has just this value.

3.4.2. Differential receiver

This stage does not consist of a real differential stage, but of a single transistor (TR1) which takes the reference ground on the emitter circuit, so the "common mode" noise arrives at the base and to the emitter equal for amplitude and phase and therefore does not show amplified on the collector.

The diode D1 serves to balance the VBE of TR1 and is always on during performance.

The transistor TR2(which is kept saturated by a logic signal when no unit is selected) has two purposes: first, through D2, it avoids the final transistor of TRAL to go in "break-down" between emitter and base for the call to + 20 of R3 and simultaneously(with R6)it does not allow the voltage level on TR1 collector to raise during disselection.

3.4.3. Output for NRZ channel

The first stage has a gain of 2 therefore it brings the nominal signal of 2Vpp to $4V_{pp}$. This is not yet the nominal value used in the 7/9 track 800 bpi standard, which is of 6Vpp, but the first circuit of the NRZ chain, ALFI B, has a gain adjustment field sufficient to balance this lower input signal.

The output of the first stage may therefore be sent, through the emitter-follower TR3, to the NRZ chain.

3.4.4. Low and high frequency band limits.

The first one concerns the fast elimination of the selection transients which here can be done with a limit of the low frequency band, as in the PM signal there are not those low frequency components which have imposed in the NRZ system the adoption of the selection unloaders.

The capacitor C2, which, with the impedence it sees afterwards forms an RC, performs this task.

The high frequency limit is instead similar to the one which is applied to the NRZ circuits, taking into account that in the 1600 PM system the signal maximum frequencies are four times higher that at 800 bpi NRZ.

The filter is at R,L,C with elliptical function and, being driven and terminated with its characteristic impedence, causes a reduction to the half of the nominal signal.

3.4.5. Amplitude equalization

The signal with 3200 flux reversals per inch has in the average (with our heads) an amplitude of about 65% of the 1600 signal; the amplitude balance between these two signals is done by TR4 through the RC network present at its emitter.

The balanced signal is present on the collector and through the emitter-follower TR5 goes to the threshold circuit coming out from pin 15.

3.4.6. Increase of the signal at 3200 (f. r. p.i.)

As this system uses the zero crossing detection to increase the time precision of this point it is convenient to increase further the 3200 signal respect to the 1600 signal.

This is obtained with TR6 which presents at the emitter a RLC network which increases the answer to the required frequency.

The signal passes then through an inversion stagge (TR8) and an emitter-follower (TR7).

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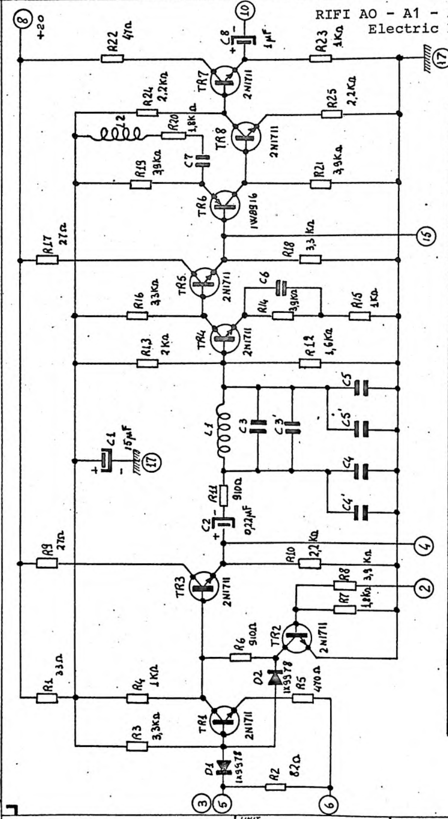
1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 - GUN 170

CONT SU FO 21 FO. 20

RIFI AO - A1 - A2
Electric Diagram



RIFI	L1	L2	C3	C3'	C4-C5	C4'-C5'	C6	C7
A0	3,3 mH	15 mH	220 pF		3000pF	680pF	3900pF	560pF
A1	1,8 mH	8,2 mH	47 pF	68pF	1000pF	1000pF	1800pF	360pF
A2	0,82 mH	3,9mH	56pF		680pF	220pF	1000pF	150pF

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3.5. RARI AO - A1 - A2

- drawing n. 015434040
- artwork n. 2342
- test n. 015740190
- electric diagram page 22

The method to obtain that the passages across zero of the signal from tape are effectivly corresponding to the flux transitions, consists of the re-shaping of the signal, performed,as far as amplitudes are concerned, by RIFI and, as far as the phases of the various harmonic components of the signal are concerned, by RARI. This contains two phase displacement networks " all pass", one for movement forward and one for reverse, as the waveform of the signal varies considerably in the two movements directions.

The forward network consists of R6, R7 and C2,C3, the reverse network of R17, R18 and C4, C5. One characteristic of these networks is that they can have only one of the four nots connected to a fixed voltage; they must, therefore, either be driven or terminated by a differential circuit.

This last one is the solution adapted in RARI; a differential stage is formed by TR1 and TR2 and the other from TR5 and TR6. Obviously only one at a time is selected acting on the respective current generator (TR4 or TR8) by turning switches TR3 and TR7 on and off.

The differential stages outputs are connected two by two, but so to be inverted with respect to an equal signal, this because between movement forward and reverse there is a polarity inversion of bits "1" and "0" and so the correct polarity is reset.

The output going to pin 5 (collectors of TR2 and TR5) is a "Test-point" to check the signal form.

The other output (collectors of TR1 and TR6) instead is limited by D1 and D2, around its mean value, at the voltage of when the two diodes are on, i.e. about 1.1 Vpp.
This signal then comes out of the board through the emitter-follower TR9.

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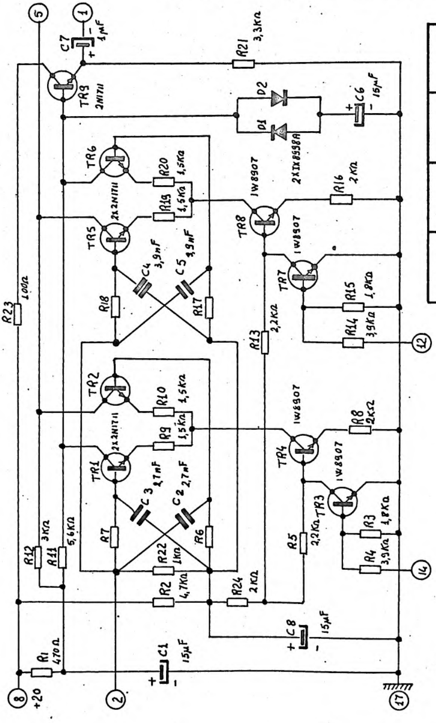
1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 - GUN 170

CONT. SU FO. 23 FO 22

RARI AO-A1-A2 Electrical Diagram



RARI	R6-R7 R17-R18
A0	12KΩ
A1	6,2KΩ
A2	3KΩ

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Cod. 3896128 F

3.6. ZEDE

- drawing N° 015434340
- artwork N° 2341
- test N° 015740200
- electric diagram page 24

The signal which has already had a first reduction by RARI is additionally squared by ZEDE; during a first time by the first two stages which amplify and limit the signal always by means of two opposite diodes; during a second time, after having passed through the emitter-follower TR3, by the trip stage formed by TR4 and TR5. This stage, working as a differential stage with very high gain, presents at the two outputs apposite wave forms, whose edges correspond to the passages through zero of the original signal.

These wave forms are differentiated from C6 and C7 and the positive edges cause the saturation for about 0,5 μs of TR6 and TR7 and therefore, the presence, at the outputs, of negative pulses of calibrated logic type with four NOR loads.

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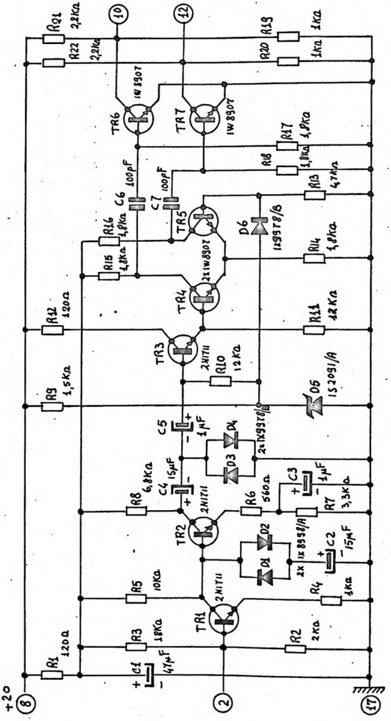
1° APPLIC. GUN 150 – GUN 170
CONT SU FO. 25 FC 24

ZEDE Electric Diagram



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3.7. PHOS AO - A1 - A2

- drawing n. 015424220
- artwork n. 2378
- test n. 015740230
- electric diagram page 33

3.7.1. Block diagram

In order to better understand the performance of the PHOS it is convenient to refer to the following block diagram (Fig. 5).

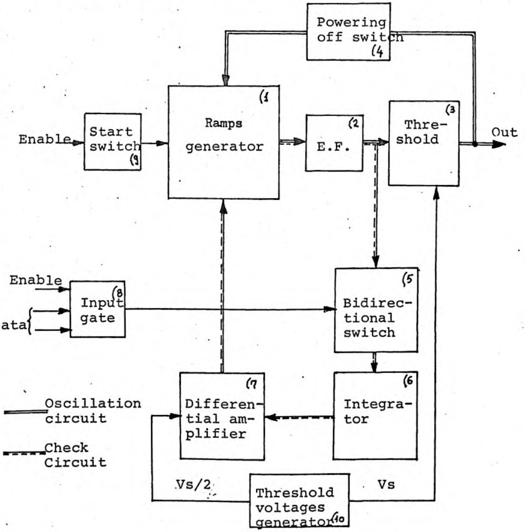

Fig. 5

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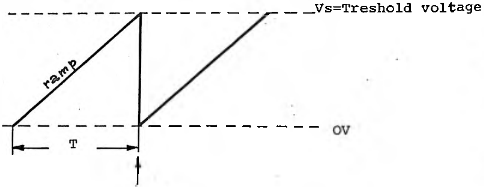
As it can be seen from the block diagram the circuit may be divided in ten parts, each one performing a precise function.

The parts, labeled with the numbers 1-2-3-4, form the oscillator which works in the following way: the ramps generator (N. 1) produces a voltage which, raises linearly from a zero level with a determined slant; this signal, whose impedence is strongly decreased by an "emitter-follower" (N. 2) enters the threshold circuit (N. 3).

When the ramp reaches the Vs determined threshold value, the powering-off switch (N. 4) is driven, which brings, the ramp signal back to zero; at this point the process starts again (Fig. 6).



Intervention of the trip circuit and of the powering-off switch

Fig. 6

In absence of other elements this part is a fixed oscillator with a period T depending on the slant of the ramp and on the value of the threshold voltage Vs.

This circuit, instead, must be related to the signals of the tape and must, therefore, have a frequency suitable to the input one.

The check circuit consisting of parts N. 5-6-7, accomplishes this task.

Circuit N. 5 is a bidirectional switch connecting the emitter-follower, from which the ramp comes out, to the integrator (N. 6).

It is driven by data pulses; during all width of the pulses, the ramp voltage is applied at the input of the integrator.

The integrator consists of an RC circuit, polarized on rest at a Vs/2 voltage.

When the switch is on at the center of the ramp, i.e. around the Vs/2 voltage, no change occurs in the integrator voltage; when, instead, the pulses intervene on the upper or lower half, the output voltage of the integrator tends respectively to increase or decrease.

This voltage, amplified by a differential amplifier (part n. 7), acts on the ramp generator (part n. 1) varying its slant so that to a frequency increase of the signals from tape, which causes a sliding downwards of the connection point of pulses and therefore a decrease of the integrator voltage, corresponds an increase in the slant of the ramp with subsequency increase.

The pulses will tend therefore to go towards the center of the ramp resetting the balance conditions.

These conditions tend, obviously, to be set also in the case of frequency decrease with a similar behavior of the circuit.

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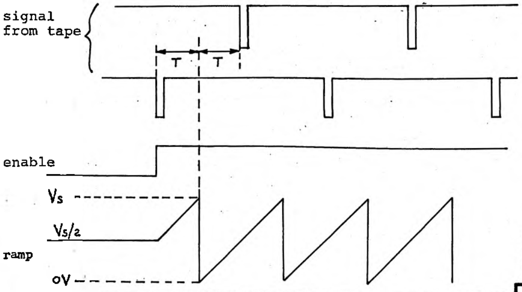
What has been taken in consideration up to now is the regime performance; a particular problem shows at the start of the circuit in the "detent phase".
Sending the signals from tape in any moments, i.e. asynchronous with respect to the internal oscillation of the circuit, a considerable time is necessary to return to the balance conditions. In order to decrease this time there is a device, formed by parts number 8 and 9, which allows the beginning of the internal oscillation synchronous with respect to a signal from tape.

This device uses also a "Flip-Flop" not included on the board.

The performance is the following; the start switch (part N. 9) in absence of the enable maintains the output level of the edge generator at a voltage of Vs/2 (Fig. 7).

By means of the external "Flip-Flop" the enable is given simultaneously upon the arrival of a signal from tape, both at the start switch and at the input gate to hook the first pulse to the center of the ramp, therefore in correct phase.

Fig. 7



The board output consists of the threshold circuit signal (a pulse at every fall of the ramp).

The PHOS circuit plans for an adjustment to be performed by means of a potentiometer and precisely the adjustment of the oscillation frequency in absence of the input signal, acting on the differential amplifier (part N. 7).

PERFORMANCE OF THE SINGLE CIRCUITS

3.7.1. Part N. 1

Generation of ramp with variable slant

It consists of a current generator (TR 1) which loads a capacitor (C2) as:

$$V = \frac{Q}{C} = \frac{I \cdot t}{C}$$

if I is constant, V is proportional to t, i.e. it raises linearly with a slant $\frac{I}{C}$.

While the capacity C is fixed, the current may be adjusted varying the base voltage of TR1, thus obtaining the needed control on the ramp slant.

3.7.3. Part N. 2

Emitter-Follower

In reality, the emitter-followers are two:TR3 and TR4 in series to have a very low output impedence.

Because of the fall of VBE of these two transistors the ramp which comes out from TR4 starts from + 1.4 V instead of OV.
This fact is taken in consideration in the Vs threshold voltage increasing it of the same quantity.

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3.7.4. Part N. 3

Threshold circuit

It consists of TR5 and TR6, in rest condition TR5 is off and TR6 is maintained on by the Vs threshold voltage applied at the base through D3. When the ramp , raising, exceeds the Vs voltage, it turns TR5 on, through D2; at this point, TR6 goes off and the positive edge present at its collector is sent (through E.F. TR7) to the powering off switch (part N. 4) and to the capacitor C4, which, raising more the base level of TR5, it increases the period during which it is on which otherwise would go off right away because of the ramp switching off. The negative edge present at the collector is brought to the output (pin 6').

3.7.5. Part N. 4.

Powering-off switch to the edge.

The positive pulse arriving from TR7 is differentiated by C3 and saturates for a short time TR2, time, though, sufficient to unload C2 whose voltage begings right away to raise again.

The diode D1 allows the capacitor C3 to unload the second edge (negative) of the powering off pulse.

3.7.6. Part N. 5

Bidirectional switch

It was seen that, during performance, the pulses of the signals from tape may hook the saw-tooth both above and below the polarization value of the integrator; this means that the current flows both in input and in output from the integrator; and therefore there is the need for a bidirectional switch.
This consists of TR10 and TR11 and of the transistors driving them i.e. respectively TR9 and TR8. TR10 is a PNP and is on when the hooking occurs in the lower part of the ramp and is therefore driven by a negative pulse. TR11 is a NPN and is on when the hooking occurs instead in the upper part and it is driven by a positive pulse.

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3.7.7. Part N. 6

Integrator

It consists of R 28 and C7; the time constant R28. C7 is chosen so not to resent of a short term effect of the "crowding", which do not change the mean frequency, without jeopardizing a rapid edjustment of the internal frequency to the one of the signals from tape when they vary their mean cycle period.

The polarization during rest is supplied by R 29.

3.7.8. Part N. 7

Differential amplifier

The differential stage consists of TR 13 and TR 14; the potentiometer P1 allows to bring the output (collector of TR 14) to the required voltage The ramp generator driving occurs through an "emitter-follower" (TR 15) which decreases the output impedence of the differential amplifier.

3.7.9. Part N. 8

Input Gate

It consists of the diodes D8 and D9 which set in OR the two pulses of the data and of the resistor R 17 which allows the saturation of TR8 thus blocking the input.

3.7.10. Part N. 9

Starting switch

In order to stop the internal oscillation and to supply the correct starting voltage of the first ramp it is sufficient to connect the resistor R 36 to ground through TR 12; in this way, the current supplied by the ramp generator instead of loading the capacitor C2 circulates in R 36, causing a voltage drop of about 3V equal to half of the maximum amplitude of the ramp.

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3.7.11. Part N. 10

Threshold voltage generator

It is supplied by the Zener D 10 which has a value of 6.8V. The Vs/2 is obtained from the voltage divider consisting of R 39 and R 40 to which R 41 can be added for a better adjustment at the center of the ramp .

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1° APPLIC GUN 150 - GUN 170

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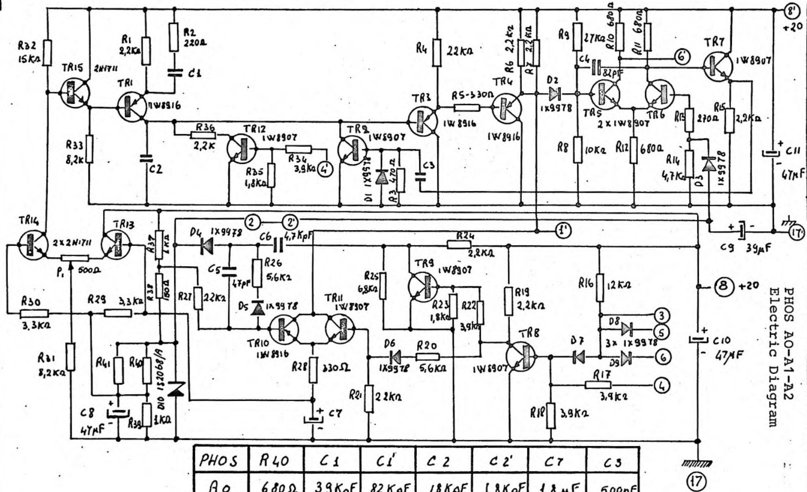
PHOS AO-A1-A2
Electric Diagram



PHOS	R 40	C 1	C 1'	C 2	C 2'	C 7	C 3
A 0	680 Ω	3,9 KpF	82 KpF	1,8 KpF	1,8 KpF	1,8 μF	500 pF
A 1	680 Ω	33 KpF	10 KpF	1,8 KpF		1,8 μF	270 pF
A 2	620 Ω	22 KpF		680 pF	220 pF	1,8 μF	150 pF

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3.8. SOGU AO - A1 - A2

- drawing N° 015434020
- artwork N° 2339
- test N° 015740210
- electric diagram pag.35

SOGU may be divided in three parts.

3.8.1. Amplifier

It consists of TR1 and it has a gain of 10; even if the signal input is 2 Vpp, it neither goes in saturation nor goes off because of the reduction performed by the subsequent stage.

Its output voltage in absence of a signal is of 6.1V and it is independent from the power supply voltage variations for the adoption of a partition ratio, for the polarization voltage, which is the inverse of the gain; in this case 1/10 and 10.

3.8.2. Threshold

The circuit performing the signal threshold check consists of the TR2 whose emitter through pin N°5 is connected to the Vs threshold voltage. Every time the signal overcomes this voltage,TR2 is saturated and its collector goes below the value of the zener D2 through which no more current circulates causing the turning off of TR3.

3.8.3. Resettable one-shot circuit

This part of the circuit is completely similar to a one-shot circuit UNRA of the SCL 1 standard with an internal time equal to three cycle periods. This allows to have a reset pulse at every negative input semi-wave and to detect the missing exceeding of the threshold after a cycle period.

In absence of the signal the output is high and it is calibrated with a single NOR load.

The relationship which allows to pass from the threshold voltage value to the threshold in percentage with respect to the signal is the following:

$$S\% = (V_s - 5.4) \times 10.$$

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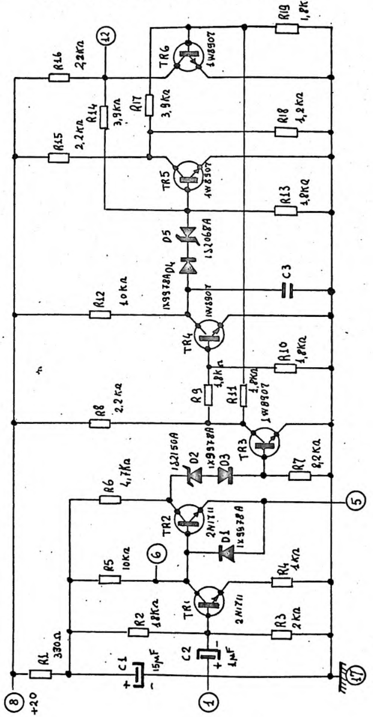
1° APPLIC. GUN 150 – GUN 170

CONT. SU FO 36 FC 35

SOGU A0-A1-A2 Electric Diagram



SOGU	A0	A1	A2
C3	22KpF	10KpF	4,7KpF

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Cod. 3896128 F

3.9. VUSO

- drawing N^ 015434140
- artwork N^ 2359
- test N^ 015740220
- electric diagram page 37

This circuit is single for all the tracks and supplies the threshold voltage to SOGU.

This voltage comes from the Zener D1 (12V) and it is adjustable by means of the **voltage divider** consisting of the potentiometer and of R3; it passes then through two emitter-followers (TR 2 and TR 3) in series to supply the low output impedence required.

Saturating the TR 1 transistor R4 goes in parallel with the **voltage divider** thus reducing the voltage at the value required for reading.

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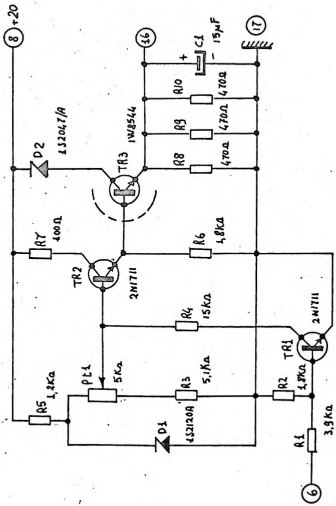
1° APPLIC. GUN 150 – GUN 170

CONT. SU FO 38 FO. 37

VUSO Electric Diagram



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4. WRITE CIRCUITS DESCRIPTION

4.1. AMRU

- drawing N^ 015433850
- artwork N^ 2307
- electric diagram page 39
- TEST

It consists of a Flip-Flop formed by the two transistors TR 1 and TR 2, counter connected.

The two masks may be simultaneously enabled or disabled by the signal entering in pin 10.

The flip-flop outputs go to two inverters (TR3 and TR4) which may be both saturated by the inhibit command (pin 16).

These two inverters go to the power switches which in saturation close alternatively to ground the write current.

An output (pin 12) allows to know the Flip-Flop status so to be in condition to send the longitudinal parity pulse, in the NRZ system, through the deskewing one-shot circuit.

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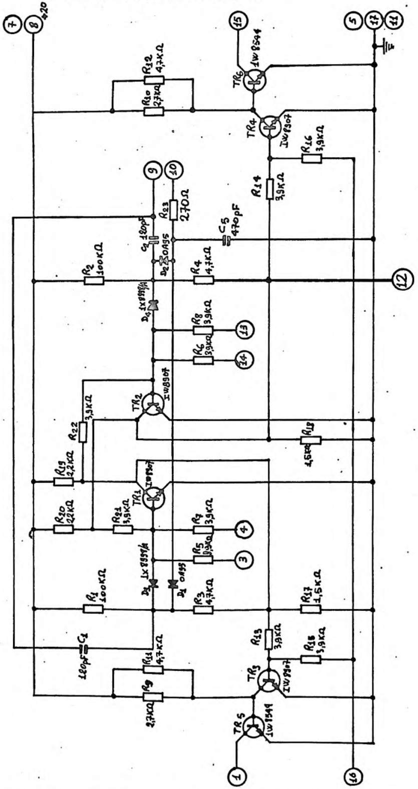
AMRU Electric Diagram



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4.2. CADI H

- drawing N^ 015434000
- artwork N^ 2329
- test N^ 015740170
- electric diagram page 42

The diagram of the principle for writing is the following: (fig. 8).

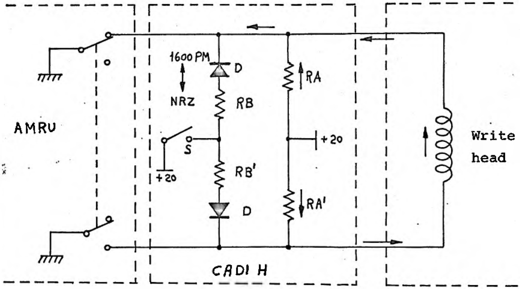

Fig. 8

The CADI H board contains two groups resistors and serves for a couple of heads.

Every resistor, in reality consists of a parallel of four resistors to distribute dissipation. The resistors labeled in fig. 8 with RB and RB' are parallelized to the RA and RA' in the NRZ system to increase the write current.
Switch S which connects to +20 the center of RB and RB' consists of TR2 and it is single for the two existing groups of resistors on the board.

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TR2 is driven by TR1 which shows at the input as a NOR load.
When TR1 is saturated by a high level in input also TR2 is saturated and therefore the total current is the one for the NRZ system; in the opposite case, TR2 is off and the RB resistors groups are isolated for the presence of diodes D.

1970.01.29
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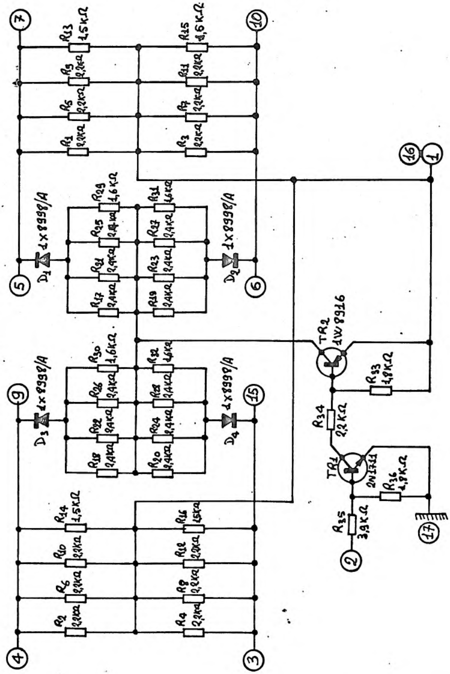
S.T.

1600 PM/NRZ Tapes Circuits

1ª APPLIC. GUN 150 - GUN 170

CONT. SU FO. 43 FO. 42

CADI H Electric Diagram



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S.T.

UNIT

COMPIL. M.Raccanelli

EMISS. 20.6.1969/pp

APPR. Benaff

SEZ. SEC. D.P.S.-GEISI

LOC. Pregnana Mil.

N.° 300041190 /A

CONT. SU FO. 43 FO. 42

Cod. 3896128 F

4.3. CADI F

- drawing N^ 015433610
- artwork N^ 2038
- electric diagram page 44
- TEST

The erase diagram is the following (fig. 9):

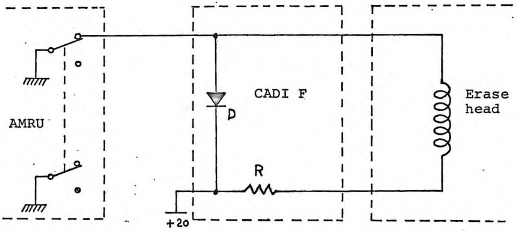


Fig. 9

As it can be seen the erasing uses a board of AMRU, blocked in a position, to select the current during writing and to disselect it during reading. The resistor R practically consists of the parallel of various resistors to distribute their dissipation.

Diode D forbids that, at the moment of the inhibition of AMRU, the inductive countervoltage of the head damages the switch transistor reducing this countervoltage to +20.

S.T.

1970.01.29

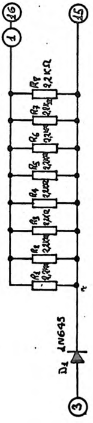
REVISION AEF 0

&èéé pm:nrz Tapes Circuits

1° APPLIC. GUN 150 - GUN 170

CONT. SU FO. 45 FO. 44

CADI F Electric Diagram



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UNIT

SEZ. SEC. D.P.S.-GEISI

LOC. Pregnana Mil.

N. 300041190/A

CONT. SU FO. 45 FO. 44

Cod. 3896128 F

4.4. URES BO - B1 - B2

- drawing N° 015434650
- artwork N° 2472
- electric diagram page 46
- TEST N° 015740650

The performance is the following one: transistor TR1 is normally saturated and it is driven by two masks of the standard type.
A negative pulse of input passing through an enable mask turns off, for a short while, TR1 which saturates TR3, this, through capacitor C4, turns off TR2.
This last one stays off until the capacitor C4 is not reloaded through R7 and R8; for all this time,

TR2 maintains TR3 saturated and therefore the output, inverted by TR4 stays high. Once the conduction threshold voltage has been reached, C4 causes the saturation of TR2 and the recovery of the starting conditions.

The short recovery time is given by the unbalance of the resistors at the terminals of C4, 500 Ω on TR3 side and some tenths of KΩ on TR2 side.

This last value, which can vary by potentiometer TR2, is the one which determines the one-shot circuit time.

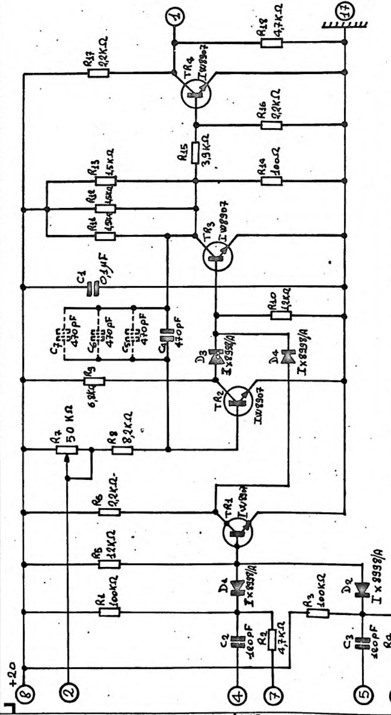
S.T.

1600 PM/NRZ Tapes Circuits

1° APPLIC. GUN 150 – GUN 170

CONT. SU FO. / FO 46

URES BO-B1-B2 Electric Diagram



BOARD		Capacitors disposition	Code
NAME	Speed ("/sec.)		
URES B₀	18,75	C_4-C_5-C_6-C_7	06121158T
URES B₁	37,5	C_4- C_5	06121159 X
URES B₂	75	C_4	06121160 V

S.T.

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DEF 0

UNIT

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APPR. Calnazzo

SEZ. SEC. D.P.S.-GEISI

LOC. Pregnana Mil.

N° 300041190 /A

CONT. SU FO. / FO. 46

Cod. 3896128 F

INSTALLATION

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

MAGNETIC TAPE SUBSYSTEM

MTC 163 to 173 — MTH 163 to 172

Installation

Second edition

A Field Engineering
publication

4.809.0.001.1/A

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	First Edition - Title page P.N. 4.809.0.001.0/A	May 1969
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Mod. 0954

N.B. Remove pages identified with crossed numbers

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1. INTRODUCTION

The purpose of this manual is to furnish a sequence of operations to optimize the installation of a MTS 160 magnetic tape subsystem.
These operations presume that the site has been adequately prepared, according to the requirements quoted in the Site Preparation manual, but do not directly consider the actual subsystem configuration.
The installation team will draw all necessary information from the following two auxiliary documents, individual to each installation :

- Site Layout
  Giving the collocation of the subsystems in the site and showing those accessories which, though not normally supplied with the subsystems, are necessary to overcome particular space or operative problems (i.e. extra low level cable ducts, cable ways, etc.).
- Unified Subsystems Connections (USC)
  The forms bearing the above name, give information upon the connection of the subsystems to :
  - . CPU or MPA connectors
  - . centralized DC power supply
  - . AC supply breakers
  - . fan supply and control
  - . AC power supply control circuit.

  A detailed description on how to use the USC forms, which also give details on the insertion of calibrating and terminator boards, will be found in the CPU Installation Manual code 4.625.0.000. /A.

> Note
>
> For all materials necessary for mechanical and electrical assemblies, cross refer to the Cables and Parts lists where they are set out according to the pertinent Kit.
> The parts and cables not included in the Kits are already assembled on the subsystem and are marked with a cross on the above mentioned lists.

The final subsystem check-out must only be carried out if the structural and electrical connections have been completed and if the Central Processor and program loading subsystem check-out has been accomplished.

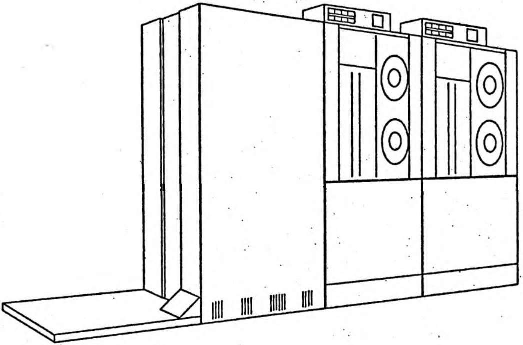

Fig. 1.1. – Magnetic Tape Subsystem

2. TOOLS AND INSTRUMENTS

- The operations to be performed to install a tape subsystem may be carried out with the use of the following equipment :
  - . engineer's tool kit
  - . site tools
  - . bushing pliers (P.N. 4355406 G) *

* Area tool level

3. ACCEPTANCE AND COLLOCATION

3.1. – PACKING

- The subsystem is shipped to its destination in a number of packages equal to the number of handlers plus one for the controller wing.
- External to each packing crate, are affixed two forms giving :
  - the contents of the crate
  - the guide to uncrate and remove from the "pallet" (*).

(*) – Wooden battened transport base

3.2. – ACCEPTANCE

- Upon receipt, all packages are to be visually examined for damage. If any damage is noticed, it will be necessary to :
  - have the carrier witness the entity of the damage
  - submit a detailed report to Headquarters.

3.3. – UNCRATING

- Ensure that the subsystem is uncrated as per rules set out by the uncrating guide attached on the outside of the crate.
- Ensure that the contents tally with the description.
- Remove the documents and accessories, contained in the crate, and set them aside.
- Set aside the following kits :

1 – MTC 163 to 173	Dwg. n°. 15023604	Parts kit	P.N. 0646852 C
2 – 1st MTH	Dwg. n° 15023067	Parts kit	P.N. 0646853 G
3 – Following MTHs	Dwg. n° 15023068	Parts kit	P.N. 0646855 Z
4 – MTS 160 – Subsystem Parts Kit	Dwg. n° 15023658	Parts kit 1	P.N. 0643157 D
		Parts kit 2	P.N. 0643158 S
5 – MTS 160 – Adjustable Layout Kit	Dwg. n° 15023265	Parts kit	P.N. 0643179 Y
6 – MTS 160-50 Hz	Dwg. n° 15023602	Cables kit 1	P.N. 0646847 G
		Cables kit 2	P.N. 0646848 V
7 – MTS 160-50 Hz - 2nd MPA Kit	Dwg. n° 15023637	Cables kit	P.N. 0643083 W

8 – MTS 160 – 50 Hz – MPS Kit	Dwg. n° 15023639	Cables kit	P.N. 0643166 A
9 – MTS 160 – 60 Hz	Dwg. n° 15023603	Cables kit 1 Cables kit 2	P.N. 0646849 Z P.N. 0646850 X
10 – MTS 160 – 60 Hz 2nd MPA Kit	Dwg. n° 15023638	Cables kit	P.N. 0643082 S
11 – MTS 160 – 60 Hz MPS Kit	Dwg. n° 15023640	Cables kit	P.N. 0643165 W
12 – MTC 163 to 173	Dwg. n° 15023604	Cables kit	P.N. 0646851 Y
13 – Following MTHs	Dwg. n° 15023068	Cables kit Parts kit	P.N. 0646854 V P.N. 0646855 Z

Note

Cable Kits 1 and 2 only differ in as much as their length is concerned.

The choice of Kits 6 through 11 depends upon the system configuration and whether the version is 50 or 60 Hz.

Kit n° 5 (P.N. 0643179 Y) is only needed when the handlers are to be connected at right angles.

3.4. – DESKIN

- Remove the MTC side covers, front and rear panels.
- Remove the ALI 260 front plate (breaker side).
- Remove the 1 MTH side covers, front and rear panels.
- Remove both front and rear panels from the following MTHs.
- Remove, from all handlers, the screw that, through the "L" bracket, holds the GUN 150 module to the main structure.
- Loosen the bracket fixing screws. Move the bracket, within its slots, to its full upward position and hence tighten the screws.
- Replace the GUN 150 fixing screw.

4. MECHANICAL ASSEMBLY

4.1. - CABLE DUCTS

- Draw out the cable duct-base elements, from the MTC Kit, and assemble them as per Site Layout plan referring to Dwg. No. 15043912.
- If the Site Layout foresees a connecting cable duct, assemble its elements as outlined in the plan itself.

4.2. - CONTROLLER

- Remove the MTC from the transport "pallet" and locate it as per Site Layout.
- Lift the MTC wheels from the floor, by rectifying the 4 adjustable feet with a 20 mm wrench; set to a true level and hence tighten the feet lock-nuts.

4.3. - MAGNETIC TAPE HANDLERS

- Place the 1st MTH as per Site Layout, keeping it 25 mm away from the MTC.
- Locate all the other handlers 25 mm away from each other. If adjustable layout Kits are available, then place as per Site Layout plan referring to Dwg. No. 15043918.
- Lift all the handlers wheels from the floor, by rectifying their adjustable feet with a 20 mm wrench, and consequently set them to plumb.
- Extract the console, packed inside each handler cabinet, and fix it in position according to Dwg. No. 15042441 - detail B - (Part. B).
- Remove the 4 side fixing screws and hence the console cover.
- Referring to Dwg. No. 15043440, fit the SO and SO1 interlock group YO wiring connector, within the console. See detail B - (Part. B).
- Replace and tighten the console cover in place.

> Note
>
> Only skin-up the units and cover all cable ducts, when all installment procedures have been fully accomplished.

5. CABLE CONNECTIONS

Note

For cable layout, follow the identification tags on the actual cables themselves and sheet 1 of Dwgs. No. 15043111 and 15043605.
If difficulties in the interpretation of cable markings should arise, refer to the attached cable lists :

Dwgs. No. 15023604 - 15023068 - 15023602 - 15023637 - 15023639 (50 Hz) - 15023603 - 15023638 - 15023640 (60 Hz).

5.1. - HANDLERS POWER CABLES

- Lay out and connect the 1st handler supply cable C3 (Kit 1 P.N. 0646851 Y) as per Dwg. No. 15043111 - sheet 1; 15043605 - sheet 1.
- Lay out all other MTHs supply cables C8 (Kit 1 P.N. 0646854 V) as per Dwg. No. 15043111 - sheet 1.
- Check each unit for correct insertion of the Hubbel plugs.
- Set the ALI 260 breaker to the OFF position.

5.2. - HANDLERS SIGNAL CABLES

- Lay out cables C9 to C11 (Kit 1 P.N. 0646854 V) following Dwg. No. 15043111 sheet 1; 15043605 - sheet 1.
- Connect up the above mentioned cables as per cable markings.
- Check the tightness of the cable connector screws.

5.3. - CONTROLLER SIGNAL CABLES

- Lay out cables C4, C6 and C7 (Kit 2 P.N. 0646851 Y) following Dwg. No. 15043605 - sheet 1.
- Connect these cables to the 1st MTH, following the pertinent markings.
- Check the tightness of the cable connector screws.

5.4. - EXTERNAL SUBSYSTEM CABLES

- Draw out cable kits 6 through 11 mentioned at para. 3.3.
- Unfurl the cables, laying them out with their symbolic marking side (i.e.

L-MTC-A) facing the CPU, the MPA or the MPS. Check that markings are complete on both cable ends.

Note

If cable markings result difficult to decipher, refer to Dwgs. No. 15023602 - 15023637 - 15023639 (50 Hz) or 15023603 - 15023638 - 15023640 (60 Hz).

- Carry out the external subsystem connections, following both the symbolic cable marking and the USC form.
- Lay out the cables along the central handlers cable channels.
- Carry out the MTC connections, following the cable markings and Dwg. No. 15043605 - sheet 1.
- Secure all cables with the appropriate clamps.
- Take up any excess cable under the low level cable ducts.

Note

Cable C20 is to be connected to the mains supply by the site electrician, who is to draw guidance from the following colour code :

Black = phase X
Red = phase Y
Blue = phase Z
White = neutral (leave floating if not present in installation)
Green = ground } connect together
Brown = screen }

6. VISUAL CHECKS

- Upon completion of all connections, carry out a visual check on the following :
  - . correctness of the mechanical assembly
  - . tightness of all nuts, screws and bolts
  - . proper insertion of all boards, cable connectors and plugs
  - . wire-wraps for loose wraps, bent pins or broken wires
  - . the layout, the path and correct attachment of all cables.

6.1. - CLEANING OPERATIONS

- Carry out Maintenance Manual routines 1.1. and 1.2.

7. CHECK-OUT

7.1. - OFF LINE CHECKS

- Set the ALI 260 MAIN BREAKER to ON, hence power up the system.
- Check that all MTC fans rotate freely and blow air upwards, otherwise check for proper phase connections on cable C21 - terminal strip P20.
- Set the output breaker to ON and check that all the handlers OFF pushbutton lights.
- Depress the 1st MTH ON pushbutton.
- Meter check for correct voltages between the "+20 V" and "GND"; "-20 V" and "GND" sockets, located on the ALI 040.
  If necessary, adjust as per Maintenance Manual routine 4.15.
- Repeat the above operations on all the other handlers.

7.2. - ON LINE CHECKS

- The checks hereby listed, are only to be carried out after the final check-out of both the Central Processor and program loading subsystem has been completed.
- Ensure that the subsystem diagnostics correspond to the P.N. and description given in the Product Composition Sheet.
- Feed through the pertinent diagnostics, adhering to the rules given in each diagnostic description.
- If a particular diagnostic program gives rise to an error halt, before attempting any troubleshooting operations, follow this procedure :
  - check for correct punching of the Site Composition Card, by referring to the Diagnostic Description Manual
  - check for correct sequence of the card deck.

  If none of these checks give rise to doubt on the accuracy of the diagnostic, proceed to troubleshooting the fault.

8. FINAL OPERATIONS

8.1. - SKIN UP

- Remove both AC and DC power from the system.
- Check that both MTC and MTH type, serial number and product code, on the yellow label, correspond to the description given in the Product Composition Sheet.
- Replace all panels, covers and plates removed previously. See par. 3.4.
- Screw on the cable duct covers (walkways), making sure that the underlaying cables are not chafed or pinched.
- Mount the MTC and MTH skirts. See Dwg. No. 15043912 - item 7.

8.2. - CHECKS AFTER HANDOVER TO CUSTOMER

- Check that the MTC and MTH drawings and their updating indices, shown in the subsystem folder, correspond to those given in the Product Composition Sheet.
- Transcribe the relevant indices on the FCO Status Log.

> Note
>
> Those drawings having several sheets with the same drawing number, are shown on the Product Composition Sheet with the highest updating index.
> On the other hand, the FCO Status Log, must show the index of each sheet.

- Check that the supplied tools and equipment correspond to the packing list.
- Prepare a report giving details of snags or defects found during the installation.

9. WITHDRAWAL

- When a subsystem is removed from a site, it must be withdrawn complete of all the cables and parts kits listed on those drawings given at par. 3.3.- kits 1 through 11.
  It is to be remembered that all those cables that on the pertinent drawings are marked with a cross, are to be left connected on the inner side of the physical unit. The remaining cables are to be disconnected both from the inner and outer sides.
  In as much as the parts are concerned, only those not marked with a cross, on the pertinent drawings, are to be removed.
- Also fulfill the below mentioned requirements :
  - All the handlers that follow the 1st MTH must be complete of both a cables kit P.N. 0646854 V and parts kit P.N. 0646855 Z. See Dwg. No. 15023068.
  - The 1st MTH must be distinctly separated from all the other handlers because its pertinent cables and parts are included in the MTC Kits.
  - The MTC must be complete of both a cables Kit P.N. 0646851 Y and parts kit P.N. 0646852 C. See Dwg. No. 15023604.
  - The cable kits necessary for the MTC to system tie-up, must be assembled according to the indications given in Dwgs. No. 15023602 - 15023637 - 15023639 (50 Hz) or 15023603 - 15023638 - 15023640 (60 Hz).

9.1. - CONTROLLER

- Remove all system power.
- Remove the cable duct walkways so as to disconnect the MTC to CPU connection cables.
- Deskin the MTC.
- Disconnect signal cables C13 - C14 and C17, between the MTC and CPU.
- Disconnect the fan supply and control cables C21 and C22.
- Disconnect the C20 AC supply cable connector.
- Remove the ALI 260 front plate.
- Disconnect the AC supply cables C23 and C24, between the MTC and Wing B.
- Disconnect the DC and GND cables C18 and C19, between the MTC and CPU.
- Signal cables C4, C6 and C7 are not to be disconnected.

9.2. - HANDLERS

- Deskin all the MTHs.
- Disconnect the 1st MTH signal cables C4, C6 and C7.
- Disconnect the Hubbel plug on cable C3,from the 1st MTH.
- Disconnect cables C9 to C11, from the outer side of all the following handlers.
- Disconnect the Hubbel plug on cable C8,from connector Y22.
- All other cables are not to be disconnected.
- Fix the GUN 150 module to the main structure with the "L" shaped bracket.

9.3. - GROUPING OF CABLES AND PARTS

- Group all the disconnected cables according to kits 1 and 2, mentioned in Dwgs. No. 15023602 (50 Hz) and 15023603 (60 Hz) or according to cable kits 1, mentioned in Dwgs. No. 15023637, 15023639 (50 Hz) and 15023638, 15023640 (60 Hz).
- Mark the above cable kits with their pertinent Part Number.
- Group all MTC parts, forming kits as described in Dwgs. No. 15023265, 15023604 and all the following MTHs parts, forming kits as described in Dwg. No. 15023068.
- Group the eventual adjustable layout kit as shown on Dwg. No. 15023265.
- Mark the above part kits with their respective Part Number.
- The cables not disconnected from the physical units are to be fixed to their respective cable ducts.

9.4. - SUBSYSTEM REMOVAL

- The physical units making up the subsystem,must satisfy the following requirements :
  - The MTC must comprise :
    - . parts kit P.N. 0646852 C
    - . subsystem parts kit {kit 1 P.N. 0643157 D or
kit 2 P.N. 0643158 S
    - . machine documentation
    - . diagnostic decks

- not yet implemented FCOs
- system cables - see dwgs. nº 15023602 - 15023637 - 15023639 (50 Hz) or 15023603 - 15023638 - 15023640 (60 Hz).

- The 1st MTH must be distinctly separated from all the following handlers and must comprise :
  - machine documentation
  - not yet implemented FCOs.
- The remaining handlers must comprise :
  - machine documentation
  - not yet implemented FCOs
  - parts kit P.N. 0646855 Z.

9.5. - SHIPMENT RULES

Check that sufficient care is taken, on behalf of the transport personnel, not to damage the machinery during loading for shipment operations.

9.6. - FINAL OPERATIONS

Fill in the appropriate shipment note and therefore return it to the pertinent office.

10. ATTACHED DRAWINGS

To complete this Installation Manual, the following drawings have been attached.

DESCRIPTION	DWG. No.	SHEET
• 1st MTH Parts kit	15023067	
• Following MTHs Parts and Cables kits	15023068	
• MTS 160 Adjustable Layout kit	15023265	
• MTS 160 - 50 Hz•Cables kit	15023602	
• MTS 160 - 60 Hz•Cables kit	15023603	
• MTC 163 to 173 Cables and Parts kit	15023604	
• MTS 160 - 50 Hz•2nd MPA kit	15023637	
• MTS 160 - 60 Hz•2nd MPA kit	15023638	
• MTS 160 - 50 Hz•MPS kit	15023639	
• MTS 160 - 60 Hz•MPS kit	15023640	
• MTS 160 Subsystem Parts kit	15023658	
• Single Capstan - Physical unit 50 - 60 Hz Assembly	15042441	
• MTH 163 - 166 Physical Block Diagram	15043111	1
• Single Capstan - Physical unit 50 - 60 Hz Assembly and Cable Pos.	15043440	1
• MTC 163 to 173 Physical Block Diagram	15043568	1
• MTC 163 to 173 Assembled Wing	15043604	1
• MTS 160 Physical Block Diagram	15043605	1
• Physical Unit Connection•Detail 13	15043912	1
• Physical Unit Connection•Detail 19	15043918	1

Note

The attached drawings are only included for useful installation reference and will not be updated.

Therefore, when reference to a particular Dwg. No. is to be made, always refer to the machine documentation and not those drawings listed above.

	MARCATURA CAVI *CABLE LABELLING*					KIT 1		KIT 2	
RIF. *REF.*	TIPO *TYPE*	LATO INT. ALL' U.F. *SIDE INT. TO PH. UNIT*	LATO EST. ALL' U.F. *SIDE EXT. TO PH. UNIT*	FUNZ. *FUNCT.*	NOTE *NOTES*	RIF. *REF.*	COD. CODICE *CODE*	Q	COD. CODICE *CODE*	Q

	DESCRIZIONE PARTI *PARTS DESCRIPTION*	KIT 1 COD. 06468536 CODICE *CODE*	Q	KIT 2 COD. CODICE *CODE*	Q	NOTE *NOTES*
X	COPERTURA LATERALE	0674180W	2			1
X	PANNELLO LATERALE	0674369K	2			
X	PANNELLO CANALE CAVI	0674256 T	3			
X	VITE T.C. M4 x 8	6311242 W	9			
X	RONDELLA ELASTICA Ø 4,3	6332104 B	9			
X	DADO ESAG. M4	6321104 W	9			

NOTE:
NOTES: 1) – Ved. dis. (see draw.) 15043 911

X) Parti montate alla spedizione – Parts assembled when delivered

REV			
DEF	0	681107	28.10.68
/	1	681284	19.11.68
/	2	690504	12.3.69

comp. UGGERI
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION

1° MTH

(SINGLE CAPSTAN)

1ª appl.

GENERAL ELECTRIC

sez.-sec.
loc.

N° 150 23 067 2
cont. su fo. — fo. 1

ST

	RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT		LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT		FUNZ. FUNCT.	NOTE NOTES	RIF. REF.	KIT 1 COD 0646854 V CODICE CODE	Q	KIT 2 COD. CODICE CODE	Q
x	C8	AL165	ALI 040	J22	ALI 040	Y22	A.C.	1	C8	0640823 X	1		
x	C9	NS112	GUN 150	J16	GUN 150	J17	LOGIC	1	C9	0640062 F	1		
x	C10	NS106	GUN 150	J14	GUN 150	J15	LOGIC	1	C10	0640031X	1		
x	C11	SELE	GUN 150	J12	GUN 150	J13	LOGIC	1	C11	0800791 G	1		

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. 0646855 Z CODICE CODE	Q	KIT 2 COD. CODICE CODE	Q	NOTE NOTES
MASCHERINA	0674370 R	2			2
VITE T.C. M4 x 8	6313114S	6			
RONDELLA PIANA Ø 4,3	6331104X	6			
RONDELLA ELASTICA Ø 4,3	6332104B	6			

NOTE:
NOTES:

1) Per percorso cavi vedi dis. 15043 111 per MTH 083-101-163-166
For cable path refer to drwg. 15043 111 for MTH 083-101-163-166

2) Parti montate come a dis. 15043 911
Parts assembled as per drwg. 15043 911

x) Parti montate alla spedizione - Parts assembled when delivered

REV			
0	681107	28.10.68	
1	690504	12.3.69	

GENERAL ELECTRIC

comp. UGGERI
emiss.
appr.
sez.-sec.
loc.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
SUCCESSIVE MTH
(SINGLE CAPSTAN)
rappl.

N° 150 23 068 1
cont. su fo. — fo. 1

ST

RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES	RIF. REF.	KIT 1 COD. CODICE CODE	Q	KIT 2 COD. CODICE CODE	Q

NOTE:
NOTES: 1) VEDERE DISEGNO (REFER TO DRW.) 15043918

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. 0643175Y CODICE CODE	Q	KIT 2 COD. CODICE CODE	Q	NOTE NOTES
PANNELLO LATERALE	0674263X	2			
GR. MONTAGGIO MOBILE X A 90°	0674508X	1			
ELEMENTO COLLEG. ANT. SX	0674185Y	1			
ELEMENTO COLLEG. ANT. DX	0674192C	1			
TAPPO CANALE CAVI	0674256T	2			
GONNA LATERALE	0674180W	2			1
VITE T.C. CAVA ESAG. M6x12	6313147H	4			
RONDELLA Ø 6,3	6331106F	4			
VITE T.C. CAVA ESAG. M4x8	6313114S	16			
RONDELLA ELASTICA Ø 4,3	6332104B	20			
VITE T.C. CAVA ESAG. M4x12	6313116A	4			
DADO ESAG. M4	6321104W	8			

REV				
DEF.	0	695041	1969.09.02	

comp.
emiss.
appr.

GENERAL ELECTRIC

sez.-sec.
loc.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION

KIT FLESSIBILITA' LAY-OUT

appl. MTS 101B - 103B - 114B - 160

Nº 15023 2650

cont. su fo. — fo. 1

S.T.

	RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	 LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
	C 13	NS 107	GUN 170 J3	L— MTC — A	LOG	7) 9)
				L— MTC — B	LOG	8) 9)
	C 14	NS 107	GUN 170 J4	L — MTC — C	LOG	7) 9)
				L — MTC — D	LOG	8) 9)
	C 17	NS113	GUN 170 J5	L — MTC — E	LOG	9)
	C 18	AL 100	MTC P11-9	U — MTC — +20	D.C.	6) 9)
	C 19	AL 101	MTC P11-4	U — MTC — MASSA	D.C.	3) 9)
	C 21	AL 147	P20-1	V — MTC — 1	A.C.	1) 9)
			2	2		2)
			3	3		3)
			4	4		4)
			5	5		5)
	C 22	AL 141	P20-7	V — MTC — 7	CONTR	4) 9)
			8	8		6)
			9	9		3)
	C 20	AL 146	ALI 260 J1	MTC A.C. INPUT	A.C.	9)
	C 23	AL 125	ALI 260 P5-1	P — MTC — 3	CONTR	4) 9)
			2	4		6)
			3	5		6)
	C 24	AL 141	ALI 260 P5-1	P — MTC — 3	CONTR	4) 9)
			4	1		3)
			3	2		6)
x	P1	---	ALI 260 P5-7	ALI 260 P5-8	CONTR	10)
x	P2	---	ALI 260 P5-4	ALI 260 P5-5	CONTR	10)
x	P3	---	ALI 260 P5-5	ALI 260 P5-6	CONTR	10)

RIF. REF.	KIT 1 COD. 0646847G CODICE CODE	 Q	KIT 2 COD. 0646848V CODICE CODE	 Q
C13	0640145K	2	0640026 C	2
C14				
C 17	0640069 V	1	0640066 G	1
C18	0640390 J	1	0640397U	1
C19	0640327 V	1	0640351 P	1
C20	0640857 T	1	0640858 Q	1
C21	0640750 W	1	0640650 D	1
C22	0640614 W	1	0640549 U	1
C23	0640519 Z	1	0640524 V	1
C24	0640618 X	1	0640614 W	1
P1	5612920 U	3	5612920 U	3
P2				
P3				

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. CODICE CODE	 Q	KIT 2 COD. CODICE CODE	 Q	NOTE NOTES

NOTE:
NOTES:

1)	Colore rosso	red
2)	" blu	blue
3)	" nero	black
4)	" marrone	brown
5)	" verde	green
6)	" giallo	yellow
7)	Connettore 1 del cavo	connector 1 of the cable
8)	" 2 " "	" 2 " " "
9)	Vedi disegno 150 43 6050	refer to drw. 150436050
10)	Ponticelli	jumper connection
x)	Parti montate alla spedizione	parts assembled when delivered

REV				
0	DEF	681361	29-11-68	

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 50 Hz

rappl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc.

Nº 150 23 602o

cont. su fo. / fo. 1

Cod. 3896041

	RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING: LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	MARCATURA CAVI / CABLE LABELLING: LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
	C 13	NS 107	GUN 170 J3	L - MTC - A	LOG	7) 9)
				L - MTC - B	LOG	8) 9)
	C 14	NS 107	GUN 170 J4	L - MTC - C	LOG	7) 9)
				L - MTC - D	LOG	8) 9)
	C 17	NS113	GUN 170 J5	L - MTC - E	LOG	9)
	C 18	AL 100	MTC P11-9	U - MTC - +20	D.C.	6) 9)
	C 19	AL 101	MTC P11-4	U - MTC - MASSA	D.C.	3) 9)
	C 21	AL 147	P20-1	V - MTC - 1	A.C.	1) 9)
			2	2		2)
			3	3		3)
			4	4		4)
			5	5		5)
	C 22	AL 141	P20-7	V - MTC - 7	CONTR	4) 9)
			8	8		6)
			9	9		3)
	C 20	AL 145	ALI 260 J1	MTC A.C. INPUT	A.C.	9)
	C 23	AL 125	ALI 260 P5-1	P - MTC - 3	CONTR	4) 9)
			2	4		6)
			3	5		6)
	C 24	AL 141	ALI 260 P5-1	P - MTC - 3	CONTR	4) 9)
			4	1		3)
			3	2		6)
x	P1	- - -	ALI 260 P5-7	ALI 260 P5-8	CONTR	10)
x	P2	- - -	ALI 260 P5-4	ALI 260 P5-5	CONTR	10)
x	P3	- - -	ALI 260 P5-5	ALI 260 P5-6	CONTR	10)

RIF. REF.	KIT 1 COD. 0646849 Z: CODICE CODE	KIT 1: Q	KIT 2 COD. 0646850 X: CODICE CODE	KIT 2: Q
C13	0640145K	2	0640026 C	2
C14				
C 17	0640069 V	1	0640066 G	1
C18	0640390 J	1	0640397U	1
C19	0640327 V	1	0640351 P	1
C20	0640645 V	1	0640646 H	1
C21	0640750 W	1	0640650 U	1
C22	0640614 W	1	0640549 U	1
C23	0640519 Z	1	0640524 V	1
C24	0640618 X	1	0640614 W	1
P1	5612920 U	3	5612920 U	3
P2				
P3				

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD.: CODICE CODE	KIT 1: Q	KIT 2 COD.: CODICE CODE	KIT 2: Q	NOTE NOTES

NOTE:
NOTES:

1)	Colore rosso	red
2)	" blu	blue
3)	" nero	black
4)	" marrone	brown
5)	" verde	green
6)	" giallo	yellow
7)	Connettore 1 del cavo	connector 1 of the cable
8)	" 2 " "	" 2 " "
9)	Vedi disegno 150 43 605o	refer to drw. 15043605o
10)	Ponticelli	jumper connection
x)	Parti montate alla spedizione	- parts assembled when delivered

REV				
0	DEF	681364	29-11-68	Autenchi

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 60 Hz

Pappl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc.

Nº 150 23 603o
cont. su fo. / fo. 1

Cod. 3890341

	RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING: LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	MARCATURA CAVI / CABLE LABELLING: LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES	RIF. REF.	KIT 1 COD. 0646960S: CODICE CODE	Q	KIT 2 COD. 0646851Y: CODICE CODE	Q
X	C3	AL116	ALI 260 Br X1	MTH - ALI 040 J22	A.C.	1-2-3	C3	0640479M	1		
			Y1			4	C4	0640036D	1		
			Z1			5	C6	0640068Z	2		
			Gr			6	C7				
			Gr			7					
X	C4	NS107	GUN 500 I04	MTH - GUN 150 J14		1 - 8					
			I03			9					
X	C6	NS113	GUN 500 I 02	MTH - GUN 150 J16		1					
X	C7	NS 113	GUN 500 I 01	MTH - GUN 150 J12		1					
X	C3	AL116	ALI 260 Br X	1° MTH J22	A.C.	11 - 3					
			Br Y			4					
			Br Z			5	C3			0640479M	1
			Gr			7	C4			0640028V	1
			Gr			6	C6			0640064Y	1
							C7			0800815L	1
X	C4	NS106	GUN 170 J14	1° MTH J14	Log.	11 -					
X	C6	NS112	GUN 170 J16	1° MTH J16	Log.	11					
X	C7	SELE	GUN 170 J12	1° MTH J12	Log.	11					

	DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. 0646852C: CODICE CODE	Q	KIT 2 COD.: CODICE CODE	Q	NOTE NOTES
X	PANNELLO LATERALE PER MTC	0674374P	1			
	MASCHERINA	0674253W	2			
X	TAPPO DI CHIUSURA CANALE CAVI	0674256T	1			
X	COPERTURA LATERALE	0674181X	1			
	ELEMENTO DI COLLEGAMENTO TIPOA	0674190X	1			
	VITE T.C. CAVA ESAG. M4x12	6313116A	2			
	VITE T.C. CAVA ESAG. M4x8	6313114S	13			10
X	RONDELLA ELASTICA Ø 4,3	6332104B	13			
	RONDELLA PIANA Ø 4,3	6331104X	13			
	DADO ESAGONALE MEDIO M4	6321104W	3			
X	BREAKER TIPO TQL 32030	0001518 B	1			

NOTE:
NOTES:
1 - PER COLLEGAMENTO CAVI LATO MTC 101 B VEDERE DIS. N° 15043 417
2 - PER COLLEGAMENTO CAVI LATO MTH VEDERE DISEGNO N° 15043 111
1 - FOR CABLES CONNECTION SIDE MTC 101 B SEE DRAWING N° 15043 417
2 - FOR CABLES CONNECTION SIDE MTH SEE DRAWING N° 15043 111
3 - Col. NERO (BLACK) 4- Col. ROSSO (RED) 5- Col. BLU (BLEU) 6- Col.MARRONE (BROWN)
7 - Col. VERDE (GREEN) 8 - SOCAPEX 2 9 - SOCAPEX 2
10 - PER IL MONTAGGIO VEDERE DISEGNO N° 15043 912 - REFER TO DRAWING N° 15043 912
11 - PER IL MONTAGGIO VED. DIS. 15043 605 - REFER TO DRAWING N° 14045 605

X = PARTI MONTATE ALLA SPEDIZIONE - PARTS ASSEMBLED WHEN DELIVERED

KIT 1 per MTC 101B/103B/114B
for

KIT 2 per MTC 163÷173
for

S.T.

REV			
0	DEF	681349	29.11.68
1		VEDI F.V.	10.3.69
2		" "	27.6.69

comp. LUGGERI 69
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTC 101 B/103B/114B/163÷173
Foppl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc. Pregnana Milanese

N° 150 23 604 2
cont. su fo. / fo. 1

RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	MARCATURA CAVI / CABLE LABELLING LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
C13	NS107	GUN 170 J3	L – MTC – A	LOG	1 – 11
			L – MTC – B	LOG	2
C14	NS107	GUN 170 J4	L – MTC – C	LOG	1 – 11
			L – MTC – D	LOG	2
C17	NS113	GUN 170 J5	L – MTC – E	LOG	
C18	AL100	P 11 – 9	U – MTC – + 20	D.C.	3-9-11
C19	AL101	P 11 – 4	U – MTC – MASSA	D.C.	4-10-11
C20	AL146	ALI 260 J1	MTC A.C. INPUT	A.C.	11
C21	AL147	P 20 – 1	V – MTC – 1	A.C.	5 – 11
		2	2		6
		3	3		4
		4	4		7
		5	5		8
C22	AL141	P 20 – 7	V – MTC – 7	CONTR	7 – 11
		8	8		3
		9	9		4
C23	AL125	ALI 260 P5–1	P – MTC – 3	CONTR	7 – 11
		2	4		3
		3	5		3
C24	AL141	ALI 260 P5–1	P – MTC – 3	CONTR	7 – 11
		4	1		4
		3	2		3
C18b	AL100	P 11 – 9	U – MTC – + 20	D.C.	3-9-11
C19b	AL101	P 11 – 4	U – MTC – MASSA	D.C.	4-10-11
		DA–FROM	A–TO		
P1		ALI 260 P5–7	ALI 260 P5–8	CONTR	
P2		ALI 260 P5–4	ALI 260 P5–5	CONTR	
P3		ALI 260 P5–5	ALI 260 P5–6	CONTR	

RIF. REF.	KIT 1 COD. 0643083 W CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q
C13	0640145K	2		
C14				
C17	0640069V	1		
C18	0640387B	2		
C18b				
C20	0640746B	1		
C21	0640745X	1		
C22	0640611Z	2		
C24				
C23	0640537A	1		
P1	5612920U	3		
P2				
P3				
C19	0640386F	2		
C19b				

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q	NOTE NOTES

NOTE:
NOTES:
1) Connettore 1 del cavo (Connector 1 of the cable)
2) Connettore 2 del cavo (Connector 2 of the cable)
3) Colore giallo (Yellow) 4) Colore nero (Black) 5) Colore rosso (Red)
6) Colore Blu (Bleu) – 7) Colore marrone (Brown) – 8) Colore Verde (Green)

9) Collegare sullo stesso morsetto (Connect to the same terminal)
10) Collegare sullo stesso morsetto (Connect to the same terminal)

11) Vedi disegno N° 15043 605 – Refer to Drw 15043 605

REV				
DEF.	0	695042	1969.09.03	Chutruchi

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 50 HZ – KIT PER 2° MPA
(KIT FOR 2ND MPA)
Pappl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc.

N° 150236370.
cont. su fo. / fo. 1

ST

RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	MARCATURA CAVI / CABLE LABELLING LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
C13	NS107	GUN 170 J3	L - MTC - A	LOG	1 - 11
			L - MTC - B	LOG	2
C14	NS107	GUN 170 J4	L - MTC - C	LOG	1 - 11
			L - MTC - D	LOG	2
C17	NS113	GUN 170 J5	L - MTC - E	LOG	
C18	AL100	P11 - 9	U - MTC - + 20	D.C.	3-9-11
C19	AL101	P11 - 4	U - MTC - MASSA	D.C.	4-10-11
C20	AL145	ALI 260 J1	MTC AC INPUT	A.C.	11
C21	AL147	P20 - 1	V - MTC - 1	A.C.	5 - 11
		2	2		6
		3	3		4
		4	4		7
		5	5		8
C22	AL141	P20 - 7	V - MTC - 7	CONTR	7 - 11
		8	8		3
		9	9		4
C23	AL125	ALI 260 P5-1	P - MTC - 3	CONTR	7 - 11
		2	4		3
		3	5		3
C24	AL141	ALI 260 P5-1	P - MTC - 3	CONTR	7
		4	1		4
		3	2		3
C18b	AL100	P11 - 9	U - MTC - + 20	D.C.	3-9-11
C19b	AL101	P11 - 4	U - MTC - MASSA	D.C.	4-10-11

RIF. REF.	TIPO TYPE	DA-FROM	A-TO	FUNZ. FUNCT.	NOTE NOTES
P1		ALI 260 P5-7	ALI 260 P5-8	CONTR	
P2		ALI 260 P5-4	ALI 260 P5-5	CONTR	
P3		ALI 260 P5-5	ALI 260 P5-6	CONTR	

RIF. REF.	KIT 1 COD.0643082 S CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q
C13	0640145K	2		
C14				
C17	0640069V	1		
C18	0640387B	2		
C18b				
C20	0640747F	1		
C21	0640745X	1		
C22	0640611Z	2		
C24				
C23	0640537A	1		
P1	5612920U	3		
P2				
P3				
C19	0640386F	2		
C19b				

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q	NOTE NOTES

NOTE:
NOTES:
1) Connettore 1 del cavo (Connector 1 of the cable)
2) Connettore 2 del cavo (Connector 2 of the cable)
3) Colore Giallo (Yellow) - 4) Colore Nero (Black) - 5) Colore Rosso (Red)
6) Colore Blu (Bleu) - 7) Colore Marrone (Brown) - 8) Colore Verde (Green)

9) Collegare sullo stesso morsetto (Connect to the same terminal)
10) Collegare sullo stesso morsetto (Connect to the same terminal)
11) Vedi disegno 15043 605 (Refer to Drw 15043 605)

REV				
	DEF	0	695042	1968.09.03

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

comp.
emiss.
appr.
sez.-sec.
loc.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 60HZ - KIT PER 2° MPA
(KIT FOR 2ND MPA)
T.appl.

Nº 15023 6380
cont. su fo. / fo. 1

RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	MARCATURA CAVI / CABLE LABELLING LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
C13-C17	NS154	GUN 170 J3	LC - MTC - AEB	Log.	1 - 11
		GUN 170 J5			2 - 11
C14	NS153	GUN 170 J4	LC - MTC - DAC	Log.	11
C18	AL100	P11 - 9	UC - MTC - +20	D.C.	3-9- 11
C18b	AL100	P11 - 9	UC - MTC - +20	D.C.	3-9- 11
C19	AL101	P11 - 4	UC - MTC - MASSA	D.C.	4-10-11
C19b	AL101	P11 - 4	UC - MTC - MASSA	D.C.	4-10-11
C20	AL146	ALI 260 J1	MTC A.C. INPUT	A.C.	11
C21	AL202	P20 - 1	VC - MTC - ACV	A.C.	5 - 11
		2			6
		3			4
		4			7
		5			8
C22	AL204	P20 - 7	VD - MTC - CONT	CONTR	7 - 11
		8			3
		9			4
C23	AL204	ALI260 P5 - 1	DC - MTC - ON	CONTR	7 - 11
		2			3
		3			4
C24	AL204	ALI260 P5 1	PC - MTC - 24V	CONTR	7 - 11
		4			4
		3			3
		DA - FROM	A - TO		
P1		ALI260 P5-7	ALI260 P5-8	CONTR	
P2		ALI260 P5-4	ALI260 P5-5	CONTR	
P3		ALI260 P5-5	ALI260 P5-6	CONTR	

RIF. REF.	KIT 1 COD. 0643166A CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q
C13-C17	0640200V	1		
C14	0640197G	1		
C18	0640390J	2		
C18b				
C19	0640327V	2		
C19b				
C20	0640746B	1		
	0640950K	1		
C22	0640962Z	3		
C23				
C24				
P1	5612920V	3		
P2				
P3				

	DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q	NOTE NOTES

NOTE:
NOTES:

1) Connettore 1 del cavo (Connector 1 of the cable)
2) Connettore 2 del cavo (Connector 2 of the cable)
3) Colore giallo (Yellow) - 4) Colore nero (blach) - 5) Colore rosso (red)
6) Colore blu (blue) - 7) colore marrone (brown) - 8) Colore verde(green)
9) Collegare sullo stesso morsetto (Connect to the same terminal)
10) Collegare sullo stesso morsetto (Connect to the same terminal)
11) Vedi disegno (Refer to drw.) 15043605

REV				
DEF.	0	695043	1969.09.03	

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 - 50Hz - KIT PER MPS
KIT FOR MPS

appl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc.

Nº 15023 639 0
cont. su fo. — fo. 1

RIF. REF.	TIPO TYPE	MARCATURA CAVI / CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES
C13-C17	NS154	GUN 170 J3	LC - MTC - AEB	LOG.	1-11
		GUN 170 J5			2-11
C14	NS153	GUN 170 J4	LC - MTC - DAC	LOG.	11
C18	AL100	P11 - 9	UC - MTC - +20	D.C.	3 - 9-11
C18b	AL100	P11 - 9	UC - MTC - +20	D.C.	3 - 9-11
C19	AL101	P11 - 4	UC - MTC - MASSA	D.C.	4 -10-11
C19b	AL101	P11 - 4	UC - MTC - MASSA	D.C.	4 -10-11
C20	AL145	ALI 260 J1	MTC-A.C. - INPUT	A.C.	11
C21	AL202	P20 - 1	VC - MTC - ACV	A.C.	5 -11
		2			6
		3			4
		4			7
		5			8
C22	AL204	P20 - 7	VD - MTC - CONT	CONTR	7 -11
		8			3
		9			4
C23	AL204	ALI260 P5 - 1	DC - MTC - ON	CONTR	7 -11
		2			3
		3			4
C24	AL204	ALI260 P5 - 1	PC - MTC - 24V	CONTR	7 -11
		4			4
		3			3

RIF. REF.	TIPO TYPE	DA - FROM	A - TO	FUNZ. FUNCT.	NOTE NOTES
P1		ALI260 P5-7	ALI260 P5-8	CONTR	
P2		ALI260 P5-4	ALI260 P5-5	CONTR	
P3		ALI260 P5-5	ALI260 P5-6	CONTR	

RIF. REF.	KIT 1 COD. 0643165W CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q
C13-C17	0640200V	1		
C14	0640197G	1		
C18	0640390J	2		
C18b				
C19	0640327V	2		
C19b				
C20	0640747F	1		
C21	0640950K	1		
C22	0640962Z	3		
C23				
C24				
P1	5612920U	3		
P2				
P3				

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. CODICE CODE	KIT 1 Q	KIT 2 COD. CODICE CODE	KIT 2 Q	NOTE NOTES

NOTE:
NOTES:
1) Connettore 1 del cavo (connector 1 of the cable)
2) Connettore 2 del cavo (connector 2 of the cable)
3) colore giallo(yellow) - 4) Colore nero (black)- 5) Colore rosso (red)
6) colore blu (blue) - 7) Colore marrone (brown) - 8) Colore verde (green)
9) Collegare sullo stesso morsetto (Connect to the same terminal)
10) Collegare sullo stesso morsetto (Connect to the same terminal)
11) Vedere disegno (refer to drw.) 15043605

REV DEF 0 685043 1969.09.03

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 160 - 60Hz - KIT PER MPS
KIT FOR MPS

Fappl.

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc.

Nº 15023 6400
cont. su fo. – fo. 1

ST

RIF. REF.	TIPO TYPE	MARCATURA CAVI CABLE LABELLING LATO INT. ALL' U.F. SIDE INT. TO PH. UNIT	LATO EST. ALL' U.F. SIDE EXT. TO PH. UNIT	FUNZ. FUNCT.	NOTE NOTES	RIF. REF.	KIT 1 COD. CODICE CODE	Q	KIT 2 COD. CODICE CODE	Q

DESCRIZIONE PARTI PARTS DESCRIPTION	KIT 1 COD. 0643157 D CODICE CODE	Q	KIT 2 COD. 0643158 S CODICE CODE	Q	NOTE NOTES
PEDANA BASE	0835819 E	4			1
COPERCHIO PIATTO	0835821 D	3			
COPERCHIO IMBOCCO TESTATA	0835823 M	1			
COPERCHIO LATERALE	0674390 T	1			
PIASTRINA	0836464 E	2			
VITE T.S. M4×20	6312748 E	2			
VITE T.S. M5×25	6312760 H	8			
VITE T.E. M8×30	6314147 W	2			
VITE T.C. CAVA ESAG. M10×40	6313206 P	6			
RONDELLA PIANA ϕ8,4	6331108 Y	4			
RONDELLA PIANA ϕ10,5	6331110 N	12			
RONDELLA ELASTICA ϕ10,5	6332110 S	6			
DADO ESAGONALE M8	6321108 X	2			
DADO ESAGONALE M10	6321110 M	6			
BASE			0674293 A	1	
COPERCHIO			0674295 T	1	
PERNI CENTRAGGIO			0674304 U	4	
GOMMINI			9431035 Y	4	
TAPPO CHIUSURA			0674303 F	1	
STAFFA ELAST.			0834665 R	2	
VITE T.C. CAVA ESAG. M6×12			6313147 H	2	
RONDELLA PIANA ϕ6,3			6331106 F	2	

NOTE:
NOTES:

1) PER IL MONTAGGIO VEDERE DIS. 15043605 - REFER TO DRAWING N° 15043605

REV				
DEF	0	690954	27.6.69	

comp.
emiss.
appr.

LISTA CAVI E PARTI PER IL COLLEGAMENTO DI UNITA' FISICHE
CABLES AND PARTS LIST FOR PHYSICAL UNIT CONNECTION
MTS 101B-103B-114B-160

Fappl. KIT PARTI SST

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

sez.-sec.
loc. Pregnana Milanese

N° 15023658 0
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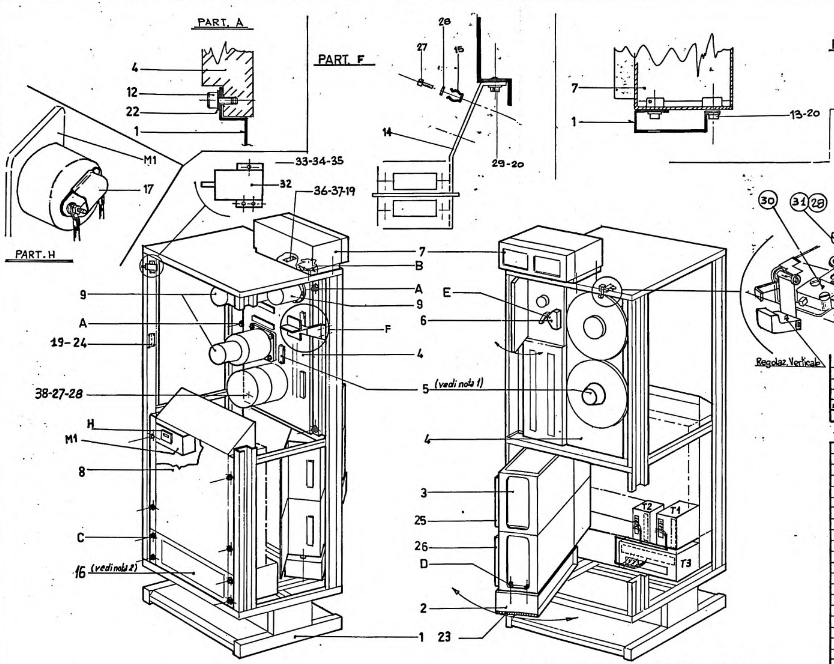
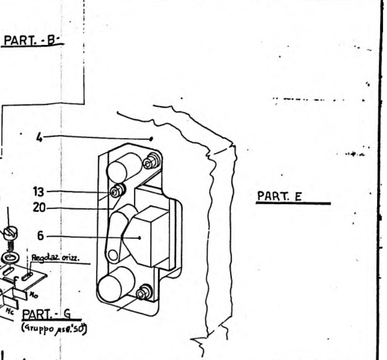
Cod. 3090045

S.T.

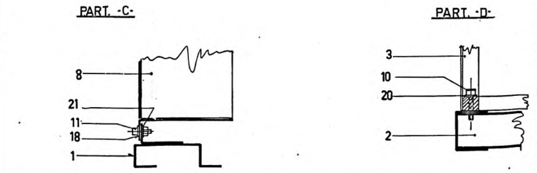




/	/	Cablaggio 60HZ		15004 0120
/	/	Schema Elettrico 60 HZ		15034 0020
1	M1	CONTATORE 50-236402-ABAA1- 220VAC -60HZ - G.E.	0001317 A	
npm	SIMB.	DESCRIZIONE 60 Hz	CODICE	DISEGNO

TABELLA VARIANTI

/	/	CABLAGGIO 50HZ		15004 0110
/	/	SCHEMA ELETTRICO 50 HZ		15034 0020
1	M1	CONTAORE Tp. 50-236402-AEAA1-220VAC-50HZ-G.E.	0000898 H	
2	/	CAPICORDA AMP TIPO 31883	5613350 W	
3	/	CAPICORDA AMP. TIPO 130447	5613328 S	
6	/	CAPICORDA AMP. TIPO 130477	5613333 D	
1	26	COPERCHIO INFERIORE	0674250 M	085432460
1	25	COPERCHIO SUPERIORE	0674251 N	085432490
1	24	TARGHETTA IDENTIF. U.F.-GE.-	0831813 R	018841550
1	23	FILTRO Tp. III ML. 16.28"x5"x0.5"	3361209 U	
3	22	RONDELLA ELASTICA ϕ 8,4 Acc.	6332108 C	
8	21	RONDELLA ELASTICA ϕ 6,4 Acc.	6332106 K	
13	20	RONDELLA ELASTICA ϕ 4.3 Acc.	6332104 B	
6	19	RIVETTI AUTOFILETTANTI Tp. A	6349875 Z	
8	18	RONDELLA PIANA ϕ 6.4 Acc.	6331106 F	
1	17	CAPPUCCIO PER CONTAORE	5250102 Z	
1	16	FILTRO Tp. IV	3361210 Z	
1	15	AGGRAFFE PRESTOLA-STAR N° B00-12	0000646 N	
1	14	SUPPORTO CONN. TESTINA - ASSIEME DI SALD. ESCRITTE	0837648 Y	15044 0550
7	13	VITE T.C. CON CAVA ESAG. M4 x15 ACC.	6313117 E	
3	12	VITE T.C. CON CAVA ESAG. M8 x15 Acc.	6313165 T	
8	11	VITE T.C. CON CAVA ESAG. M6 x15 Acc	6313148 W	
4	10	VITE T.C. CON CAVA ESAG. M4 x20 Acc.	6313119 X	
/	9	MUN 143-144		
/	8	ALI 040		
/	7	TAV 240		
/	6	MUN .... (022 o 043A/T o 053 o 062)		
/	5	MUN 141/142		
/	4	MUN 140		
/	3	GUN 150 (GUN 151 ÷ 156) (GUN 161 ÷ 169)		
/	2	CON 271		
/	1	CON 270		
npm	SIMB.	DESCRIZIONE 50 Hz	CODICE	DISEGNO



Note: 1) Per il montaggio del MUN 141 simb. 5 vedere dis. 22943793-
2) Per il montaggio del filtro a simb. 16 vedere dis. 14451643-

1	38	RONDELLA PIANA ϕ3.2	6331103A	
	37	TARGHETTA IDENTIF. CODICE	0834416U	
	36	TARGHETTA U.E.	0834397W	
	35	DADO M3	6321103H	
	34	RONDELLA ϕ3.2	6331103A	
	33	VITE TCCE M3x8	6313101G	
	32	GRUPPO MICROSWITCH "50"1"		15044624
2	31	VITI T.C M3x5	0680193K	
1	30	GRUPPO MICROSWITCH "50"	0842749S	15044543
2	29	VITE T.C. CAVA ESAG. M4X10	6313115W	
3	28	RONDELLA ELASTICA ϕ3.2	6332103N	
2	27	VITE T.C. M3x8	6311231R	
nPm	SIMB	DESCRIZIONE	codice	DISEGNO

GENERAL ELECTRIC

UNITA' FISICA
SINGLE CAPSTAN

ASSIEME 50-60HZ

Scala
Firma Boffelli
ST 13/11/67
MAT.
TT
FIN.

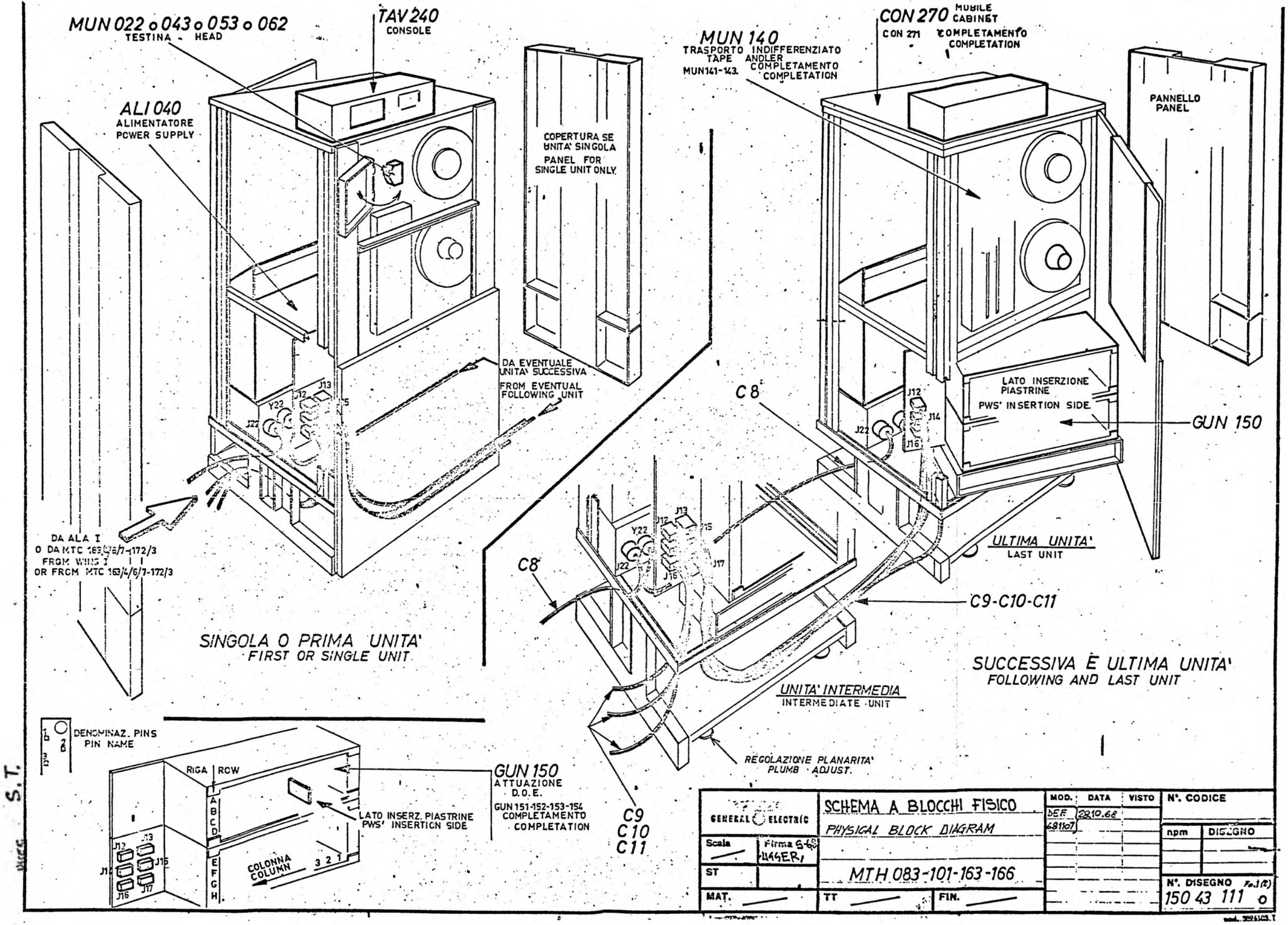
MOD.	DATA	VISTO
95644	24-10-[illegible]	[illegible]
YEREX	17-1-68	[illegible]
	8.10.68	[illegible]
	4.2.69	
	21.2.69	
	24.3.69	
	25.4.69	

N°. CODICE

npm	DISEGNO
1	150434400

N°. DISEGNO
15042 441 6

F.to 420x594
cod. 3896106 Y



S. T.

GENERAL ELECTRIC	SCHEMA A BLOCCHI FISICO PHYSICAL BLOCK DIAGRAM	MOD.	DATA	VISTO
Scala	Firma S-68 ULLGER,	DEF 681107	28.10.68	
ST	MTH 083-101-163-166			
MAT.	TT	FIN.		

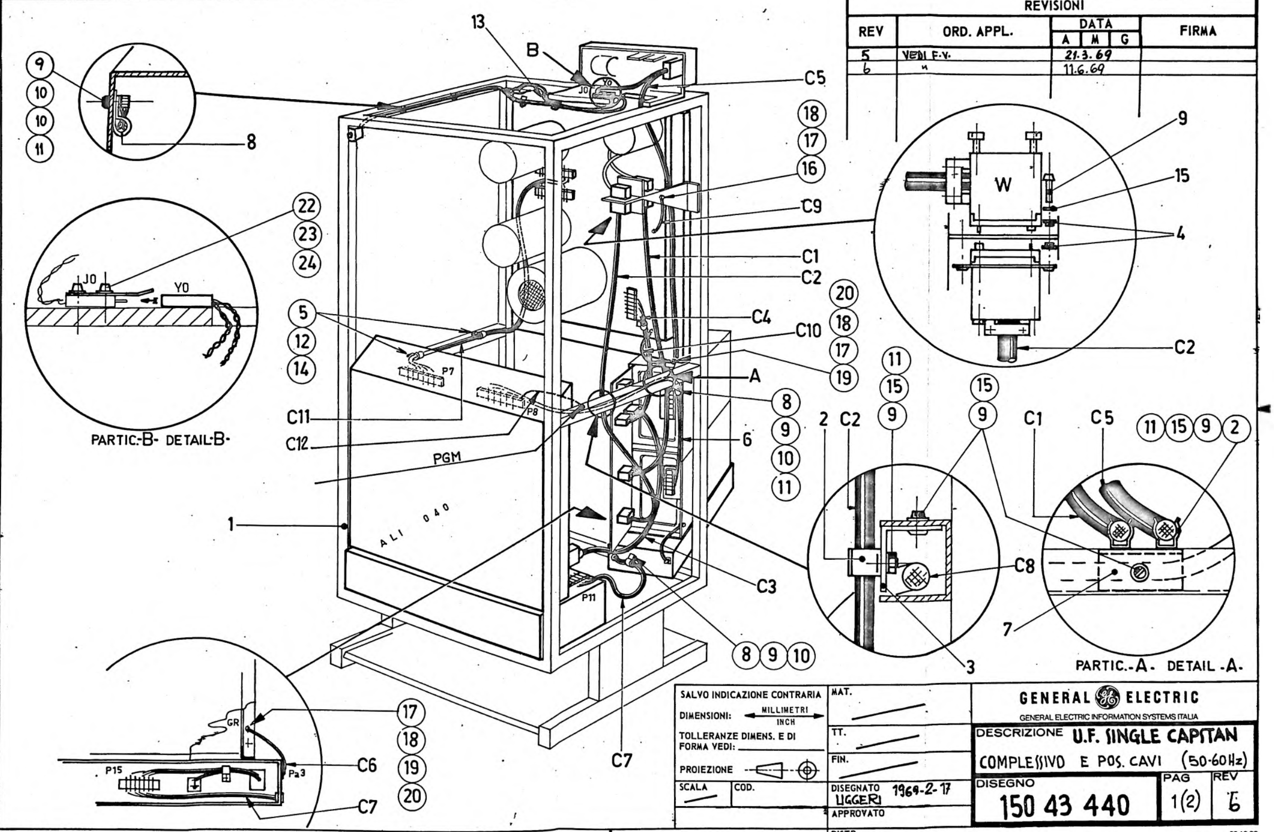
N°. CODICE

npm | DISEGNO

N°. DISEGNO Fo.1(2)
150 43 111 o

mod. 399103.T

REVISIONI					
REV	ORD. APPL.	DATA			FIRMA
		A	M	G	
5	VEDI F.V.	21.3.69			
6	"	11.6.69			



SALVO INDICAZIONE CONTRARIA DIMENSIONI: MILLIMETRI / INCH TOLLERANZE DIMENS. E DI FORMA VEDI: PROIEZIONE	MAT.
	TT.
	FIN.
SCALA	COD.
	DISEGNATO LIGGERI 1969-2-17
	APPROVATO
	DISTR.

GENERAL ELECTRIC

GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

DESCRIZIONE **U.F. SINGLE CAPSTAN**

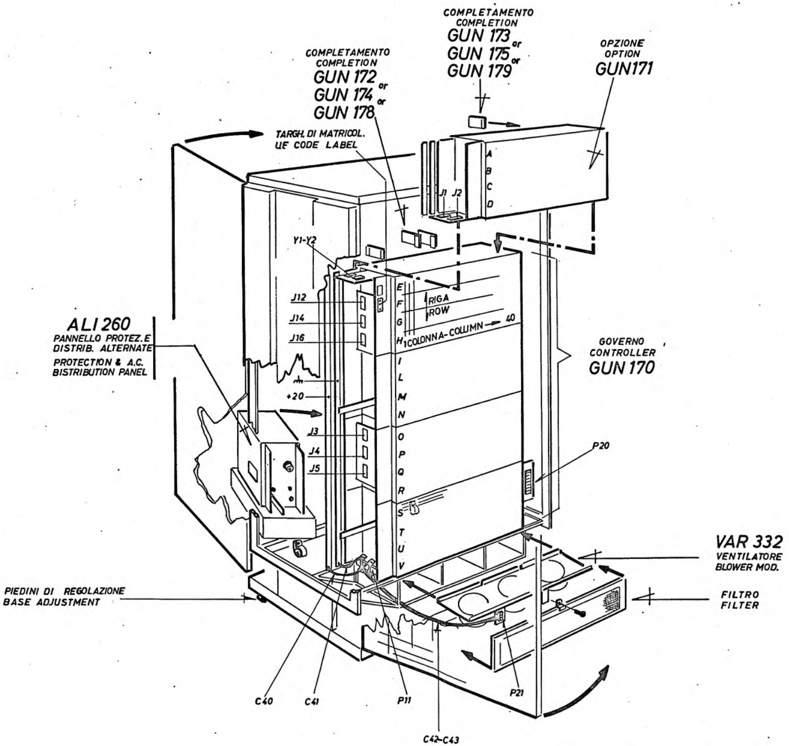
COMPLESSIVO E POS. CAVI (50-60Hz)

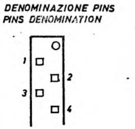
DISEGNO	PAG	REV
150 43 440	1(2)	6

S.T.

Cod. 3896104Q

68.10.30





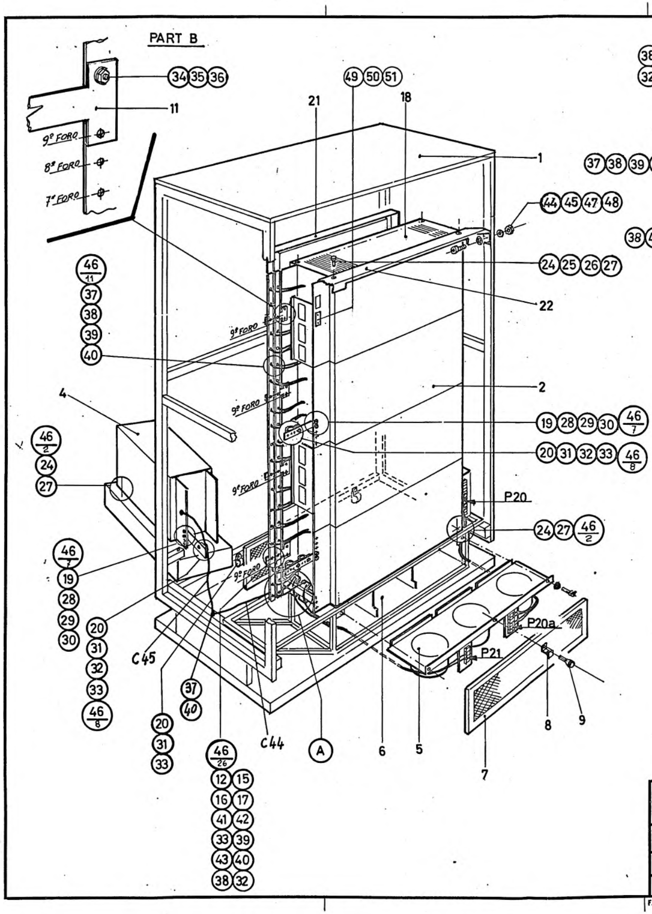
GENERAL ELECTRIC		U.F MTC 163 ÷ 173	MOD.	DATA	VISTO
		SCHEMA BLOCCHI FISICO	DEF 681369	29-11-68	
Scala	Firma	PHISICAL BLOCK DIAGRAM			
ST	7-8-68	50-60 Hz			
MAT.		TT	FIN.		

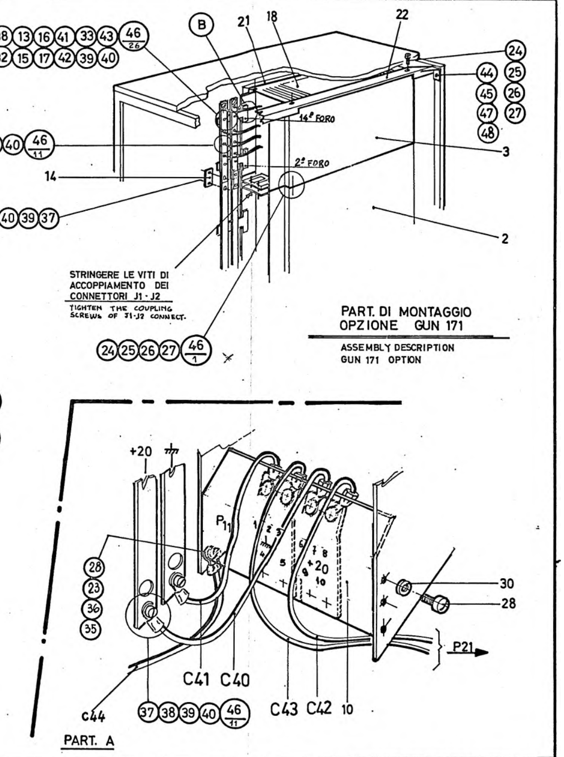
N°. CODICE

nom | DISEGNO

N°. DISEGNO 1(2)
150435680

F.to 297 × 420


PART B


PART. DI MONTAGGIO OPZIONE GUN 171

ASSEMBLY DESCRIPTION GUN 171 OPTION

STRINGERE LE VITI DI ACCOPPIAMENTO DEI CONNETTORI J1 - J2

TIGHTEN THE COUPLING SCREWS OF J1-J2 CONNECT.

PART. A

GENERAL ELECTRIC

MTC163÷173

ALA ALLESTITA

ASSEMBLED WING

MOD.	DATA	VISTO
DEF. 68/69	29-11-68	Antonelli
VEDI E.V	10.3.69	
"	69.07.11	

Scala

Firma Coppelli

ST 12/7/68

MAT.

TT

FIN.

N°. CODICE VED.TAB. FOGL (2

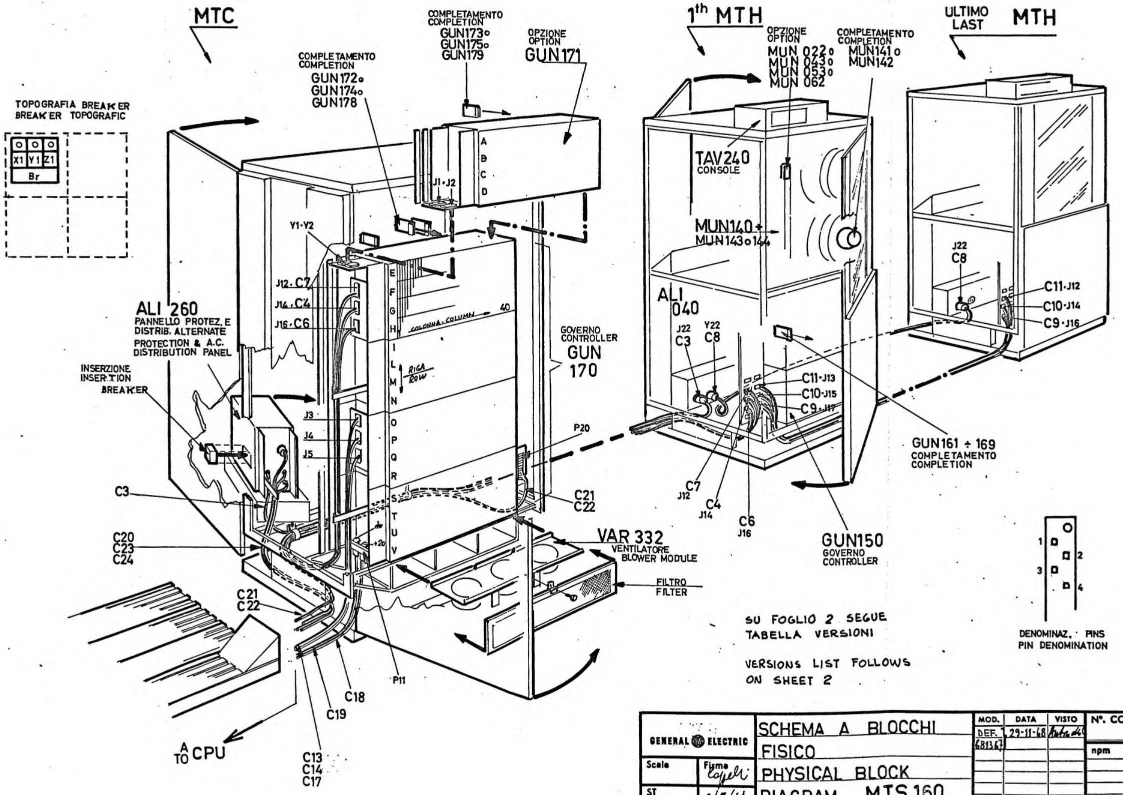
npm

DISEGNO

N°. DISEGNO 1 (2)
150436043

F.to 297x420

cod. 3896103 T



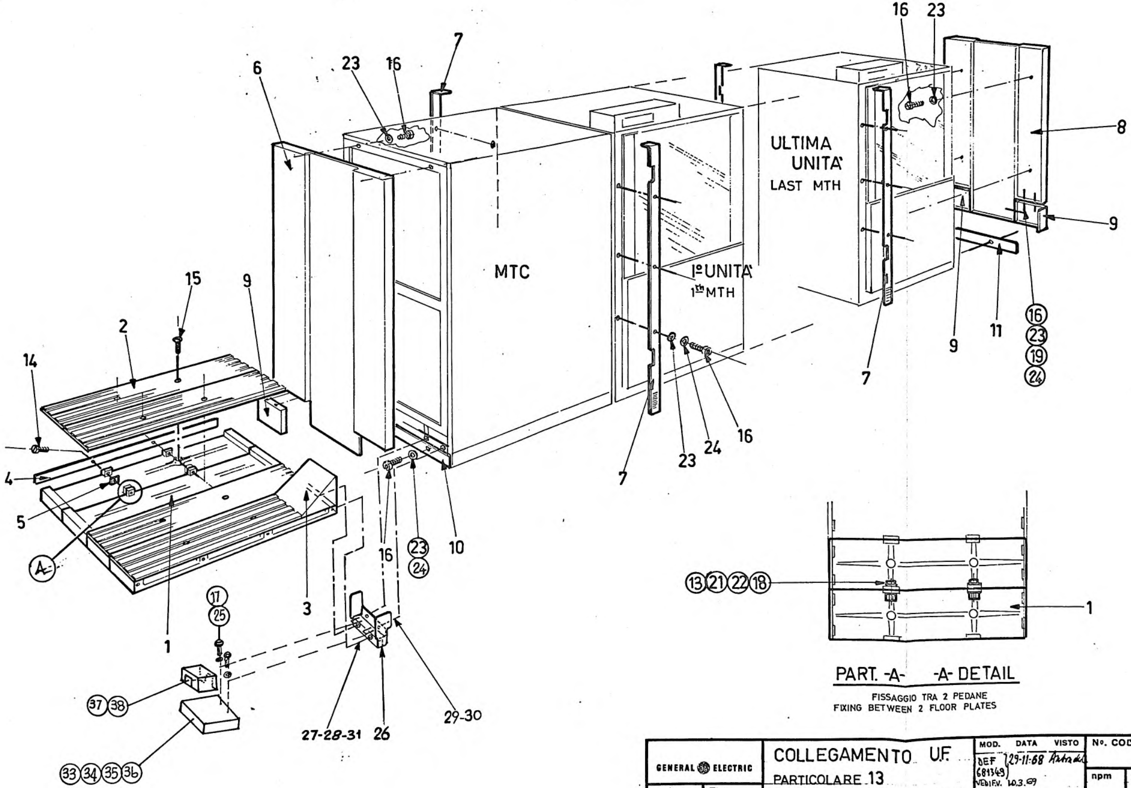
SU FOGLIO 2 SEGUE TABELLA VERSIONI

VERSIONS LIST FOLLOWS ON SHEET 2

GENERAL ELECTRIC		SCHEMA A BLOCCHI	MOD.	DATA	VISTO	N°. CODICE
		FISICO	DEF. 68136	29-11-68		npm / DISEGNO
Scala	Firma Coppoli	PHYSICAL BLOCK				
ST	19/7/68	DIAGRAM MTS 160				N°. DISEGNO 15043605 1 (2 0
MAT.		TT / FIN.				

F.to 297x420

cod. 3976103 T



PART. -A- -A- DETAIL

FISSAGGIO TRA 2 PEDANE
FIXING BETWEEN 2 FLOOR PLATES

GENERAL ELECTRIC

COLLEGAMENTO U.F.
PARTICOLARE 13
PHYSICAL UNIT CONNECT.
DETAIL No 13

Scala
Firma: Coffell
ST 17/7/68
MAT.
TT
FIN.

MOD.	DATA	VISTO
DEF (681349)	29-11-68	Astrada
VEDIF.V.	10.3.69	
"	27.6.69	

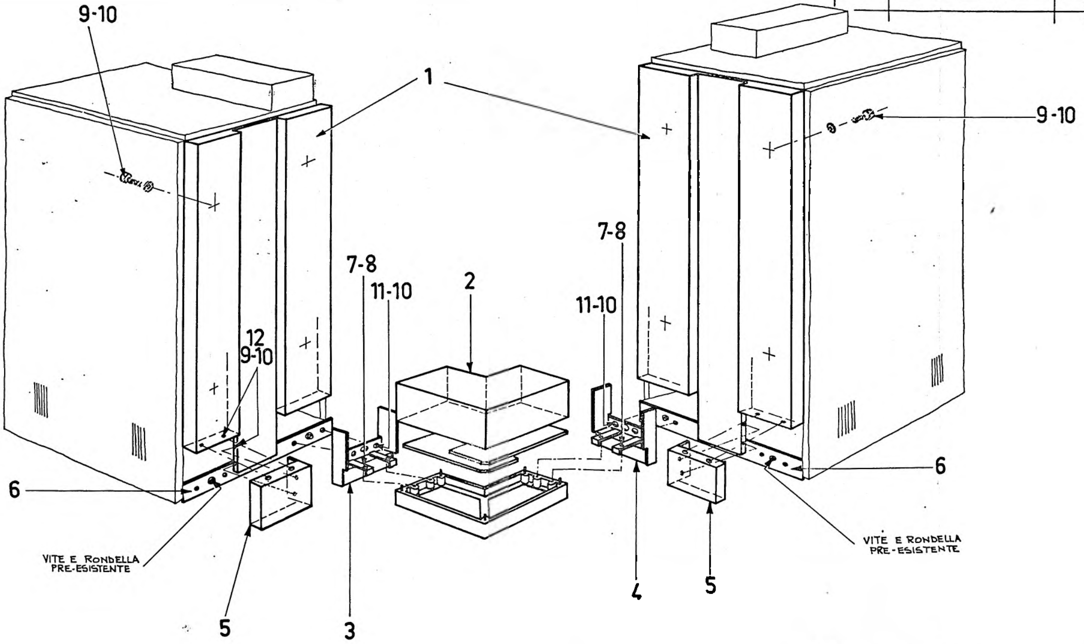
N°. CODICE
npm
DISEGNO
N°. DISEGNO 1 (2
150 43 912 2

F.to 297 x 420
cod. 3894103

S.T.

15043 918 0

REVISIONI					
REV	ORD. APPL.	DATA			FIRMA
		A	M	G	
0	695041	68	09	02	Rinaldi



SALVO INDICAZIONE CONTRARIA

DIMENSIONI: MILLIMETRI / INCH

TOLLERANZE DIMENS. E DI FORMA VEDI: ______

PROIEZIONE

SCALA

COD.

MAT.

TT.

FIN.

DISEGNATO UGGERI 68 GIU 21

APPROVATO

DISTR.

COD.

GENERAL ELECTRIC

GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

DESCRIZIONE

COLLEG. U.F. PARTICOL. 19

DISEGNO 15043 918

PAG 1(2)

REV 0

S.T.

Cod. 3896104 Q

68 10 30

MAINTENANCE

1

MTC 163 to 173 - MTH 163 to 172 SUBSYSTEM

Maintenance

Second edition

A Field Engineering
publication

4.809.4.001.1/A

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	27 – 32 – 32/a – 33 – 34 – 35 – 36 – 38 – 41 – 44 – 45	
	46 – 46/a – 48 – 60 – 62 – 63 – 69 – 70 – 70/a – 77 –	
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	124 – 124/a – 127 – 128 – 128/a – 139 – 140 – 142	November 1970
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1. OPERATOR TASKS

ROUTINE : 1.1

NAME : General cleaning
DURATION : 0.10 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Tape Unit Cleaner pack	P.N.	5670106 C
– Chammy leather	"	5670104 U

2 – PURPOSE

– To ensure constant subsystem performance and reduce media wear to minimum.

3 – PRELIMINARY CHECKS

– None.

4 – PROCEDURE

1) – Open the Tape Unit Cleaner pack and unfold the contents.

> **Note**
> **The content of the pack is sufficient to clean one handler. The chammy leather dampened with Tape Unit Cleaner fluid can be used as an alternative to the pack.**

2) – Open the unit door, the top and bottom bin covers.

3) – Open the head-mu-shield and clean with Tape Unit Cleaner :
   - the surfaces of the cylindrical roller and of the slanted guide,
   - the tape cleaner surface.

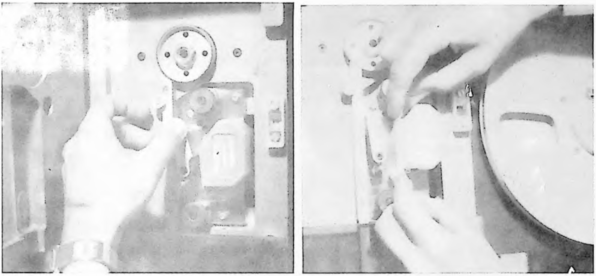


Fig. 1.1. – Cleaning the magnetic head

Caution
Do not ever allow metal or magnetic objects to come in contact with the Read/Write magnetic head.

4) – Slowly and carefully rotate the capstan with the finger tips of one hand. While holding the cleaner against the capstan with the other hand, remove all oxide build-ups.

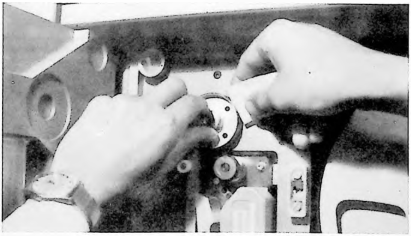


Fig. 1.2. – Cleaning the capstan

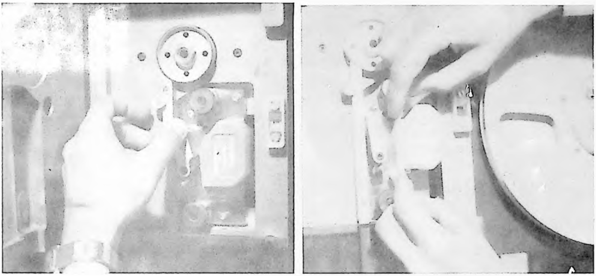


Fig. 1.1. - Cleaning the magnetic head

Caution

Do not ever allow metal or magnetic objects to come in contact with the Read/Write magnetic head.

4) - Slowly and carefully rotate the capstan with the finger tips of one hand. While holding the cleaner against the capstan with the other hand, remove all oxide build-ups.

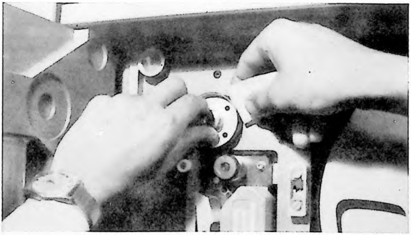


Fig. 1.2. - Cleaning the capstan

5) - Carefully clean the inside surfaces of both tape bins, paying particular attention to the corners. Also clean the roller guide and bottom bin glass cover.

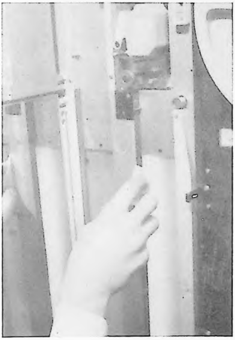


Fig. 1.3. - Cleaning the bins

6) - Wipe off any traces of oxide from the main casting, from all guides and all surfaces that come in contact with the tape.

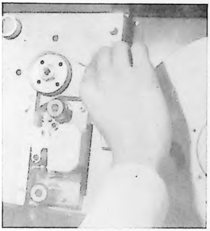


Fig. 1.4. – Cleaning the casting

7) – Clean the packing arm, paying particular attention to free its shoe from any oxide build-ups.

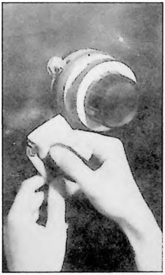


Fig. 1.5. – Cleaning the packing arm

8) – Wipe over again with the chammy leather all surfaces and parts cleaned beforehand.

5 – FINAL CHECKS

– None.

ROUTINE : 1.2

NAME : Sliding window
DURATION : 0.10 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Chammy leather	P.N.	5670104 U
- Polish antistatic	"	3134120 K

2 - PURPOSE

- To remove the electrostatic charges that accumulate dust particles over the sliding window surface.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Lift up the sliding window.

2) - Wipe over the whole surface with antistatic polish.

3) - Polish to a high gloss with the chammy leather.

> **Caution**
> **Do not use solvents such as Freon T.F., Acetone, Benzene or Carbon Tetrachloride (CTC). These will attack and ruin the perspex surface.**

4) - Open the front door and repeat step 3 on the inside surface.

5) - Close the front door.

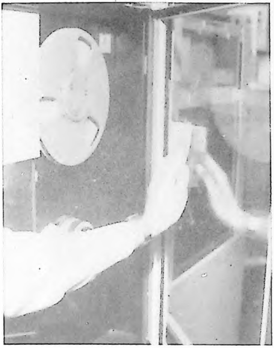


Fig. 1.6. – Cleaning the sliding window

5 - FINAL CHECKS

- None.

2. MAINTENANCE CHECKS

ROUTINE : 2.1
NAME : Vacuum check
DURATION : 0.10 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Vacuum gauge P.N. 4355390 M
- Open end wrench - 12 mm
- Work tape

2 - PURPOSE

- To check the value of vacuum.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Remove the blanking cap and screw in its place the vacuum gauge adaptor. See Fig. 2.1.

2) - Switch the unit ON. Mount the work tape and press LOAD.

3) - Check vacuum level to be:

600 to 830 mm H_2O

for those units fitted with collector type vacuum motors or

650 to 700 mm H_2O

for those units fitted with induction type 50-60 Hz Siemens motors. Appropriately rotate the vacuum pressure adjust clamp, on these latter motors, to obtain the correct level.

4) - Remove the tape and switch the unit OFF.

5) - Disconnect the vacuum gauge and replace the blanking cap.

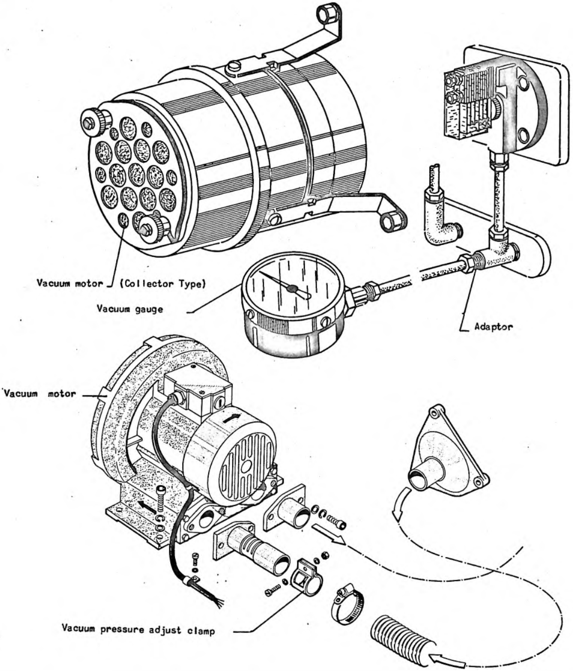


Fig. 2.1. - Checking the vacuum

5 - FINAL CHECKS

- None.

3. CLEANING AND LUBRICATION

ROUTINE : 3.1

NAME : Tape transport cleaning
DURATION : 0.20 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Tape Unit Cleaner pack	P.N. 5670106 C
- Chammy leather	" 5670104 U
- Universal handle	" 7138485 B
- Screwdriver blade 6 x 150	" 4355315 F

2 - PURPOSE

- To ensure perfect cleanliness of all tape transport items.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Open the unit door and the upper bin cover. Slacken the screws securing the fixing rings of the cylindrical and slanted guides. Remove the rings.

2) - Lift the mu-shield and carefully clean the head surfaces and the tape cleaner.

3) - Accurately clean the capstan, the cylindrical guide and the slanted guide.

4) - Manually rotate the capstan and accurately clean its outer rubber covered surface.

5) - Open the bin cover and clean it accurately both in and out.
Clean the cavuum bins, paying particular attention to edges and sealing surfaces.

6) - Accurately clean the upper bin cover inner surface, casting, upper tape guide and upper and lower rollers.

7) - Clean the packing arm shoe surface.

8) – Remove any oxide accumulation and dust from all transport devices and the sliding window.

9) – Wipe over all surfaces touched by the tape, except the capstan, with the chammy leather.
Replace the fixed rings of the slanted and cylindrical guides. Close the bin covers and the unit door.

5 – FINAL CHECKS

– None.

ROUTINE : 3.2

NAME : Ventilation filter cleaning
DURATION : 0.20 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- None.

2 - PURPOSE

- Restore filtering efficiency to the ALI 040, GUN 150 and GUN 170 filter packs.

3 - PRELIMINARY CHECKS

- Before initiating cleaning operations, check that the filter elements are not damaged or deformed otherwise, replace.

4 - PROCEDURE

1 - ALI 040 Filter

- Open the unit rear door and remove the filter. Refer to fig. 3.2.

2 - GUN 150 Filter

- Open the front door, swing out the GUN 150 and remove the filter element mounted on the CON 271. Refer to fig. 3.1.

3 - GUN 170 Filters

- Open the GUN front door and remove the filter. Refer to fig. 3.3.
- Open the rear door, swing out the ALI 260 and remove the filter. Refer to fig. 3.4.

4 - Air blast or vacuum clean the filter elements.

5 - Replace the elements, close the subsystem doors.

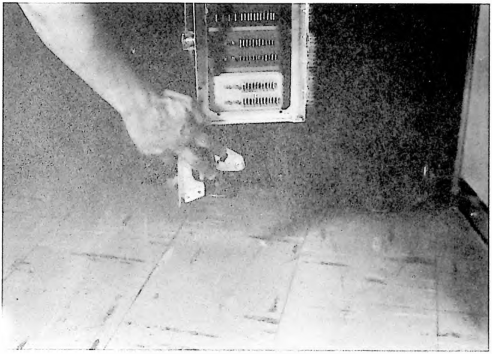


Fig. 3.1. - Electronics Module Filter Removal

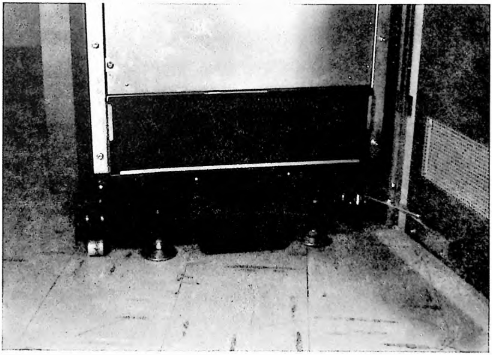


Fig. 3.2. - Power Supply Filter

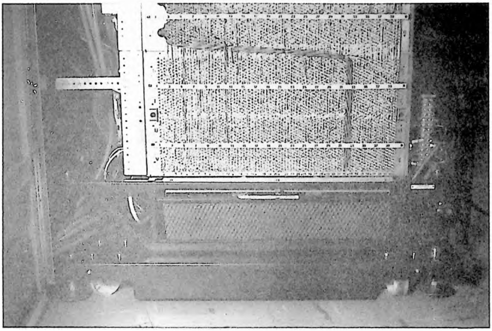


Fig. 3.3. - Controller Front Filter

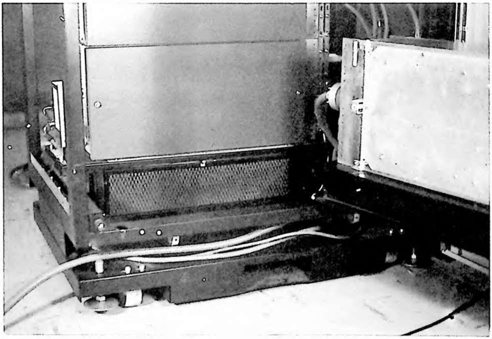


Fig. 3.4. - Controller Rear Filter

5 - FINAL CHECKS

- None.

4. ADJUSTMENTS

ROUTINE :**4.1**

NAME : Machine reel hub adjustment
DURATION : 0.50 hr.
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen key	P.N. 4355647 Y
- Gauge	" 0842726 B
- Allen Key - 4 mm	

2 - PURPOSE

- To prevent the tape touching the reel flanges.

3 - PRELIMINARY CHECKS

- Implement routine 4.39

4 - PROCEDURE

1) - Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.
2) - Adjust the 4 handler feet to lift the pertinent unit from the floor.
3) - Draw the unit out of its physical lay-out configuration position.
4) - Remove the 3 set screws fixing the machine reel hub cover. Remove the cover.
5) - Remove the machine reel.
6) - Switch the unit ON. Open the top bin cover to free the reel brakes.
7) - Rotate the hub until the fixing set screws are visible through the hole in the casting rib, hence loosen them using Allen key P.N. 4355647 Y.
8) - Rest the gauge on the bin casting reference plane (bin lip). Move the hub to have the outer flange surface contact the gauge. Tighten the 3 set screws, starting with the one that screws onto the shaft key.
9) - Gauge check the hub position, on at least 4 points 90° apart, taking up any errors by repeating steps 7 and 8.

10) - Replace the unit by following steps 6 through 1, carrying out the described operations in the reverse order.

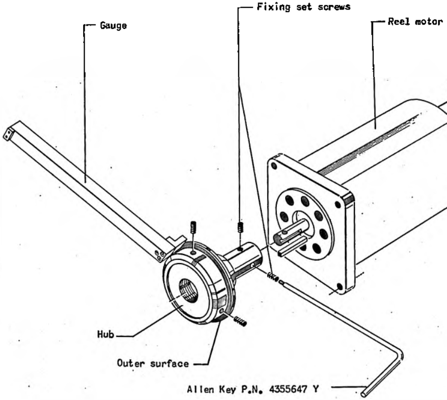


Fig. 4.1. - Machine reel hub adjustment

5 - FINAL CHECKS

- Carry out Routine 4.39.

ROUTINE : **4.2**

NAME : File reel hub adjustment
DURATION : 0.50 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen, key	P.N. 4355647 Y
- Gauge	" 0842726 B
- Feeler	" 0687305 M

2 - PURPOSE

- To prevent the tape touching the reel flanges.

3 - PRELIMINARY CHECKS

- Implement routine 4.39.

4 - PROCEDURE

1) - Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.

2). - Adjust the 4 handler feet to lift the pertinent unit from the floor.

3) - Draw the unit out of its physical lay-out configuration position.

4) - For handlers mounting rubber hub back-up rings, remove this ring and replace it with feeler P/N 0687305 M. For units not fitted with rubber hub rings, proceed with step 5.

5) - Switch the unit ON. Open the top bin cover to free the reel brakes.

6) - Rotate the hub until the fixing set screws are visible through the hole in the casting rib, hence loosen them using Allen key P.N. 4355647 Y.

7) - Rest the gauge on the central and right bin walls. Move the hub to have the outer feeler or flange surface contact the gauge. Tighten the 3 set screws, starting with the one that screws onto the shaft key.

8) - Gauge check the hub position, on at least 4 points 90° apart, taking up any errors by repeating steps 6 and 7.

9) - Replace the unit by following steps 5 through 1, carrying out the operations in the reverse order.

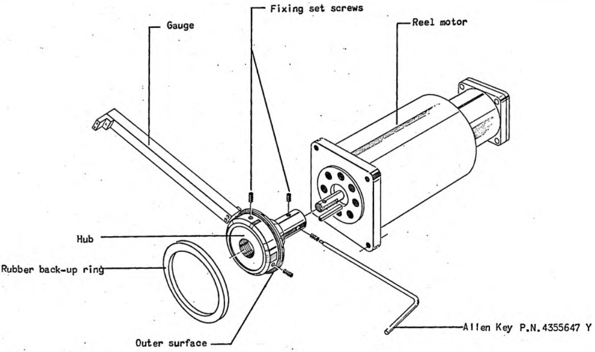


Fig. 4.2. - File reel hub adjustment

5 - FINAL CHECKS

- Carry out Routine 4.39.

ROUTINE : **4. 3**

NEME : File reel hub locking adjustment
DURATION : 0.15 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Vernier, gauge
- Allen key 2 mm

2 - PURPOSE

- To ensure that the file reel is positively locked, thus preventing hub to reel slippage.

3 - PRELIMINARY CHECKS

1) - Visually inspect the ring and shoe assembly. Ensure that no separation has occurred between metal shoes and rubber ring, otherwise replace ring as per Routine 5.2.

2) - Check the hub, inspecting the tapered surface for score marks or concentric lines such to prevent good operation.
If it is found damaged, change the hub as per Routine 5.1.

4 - PROCEDURE

1) - Turn the file reel knob clockwise to its stop.

2) - Slacken the fixing set screws. Turn the knob clockwise until the diameter of the metal shoes results:

94.5 to 94.6 mm

with one set screw at right angle, and the other in line with the slot in the knob;positioning the vernier calipers as shown in fig. 4.3 for this measurement.

3) - Tighten the two set screws onto the cam. Turn the knob anticlockwise to its end of travel.

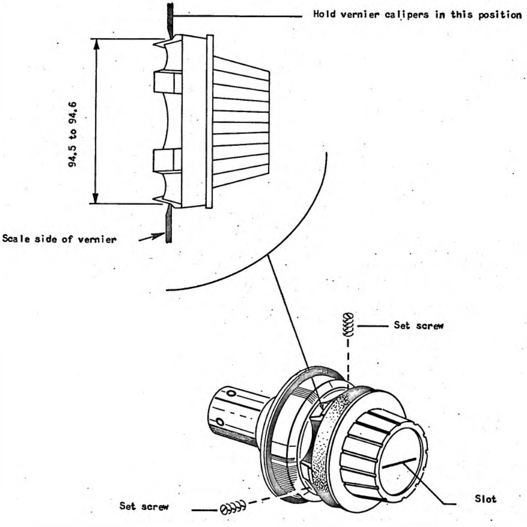


Fig. 4.3. - File reel hub locking adjustment

5 - FINAL CHECKS

- None.

ROUTINE : 4.4

NAME : Packing arm adjustment
DURATION : 0.35 hr.
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Dynamometer	P.N. 0158701 U
- Allen key 2 mm	
- Allen key 3 mm	

2 - PURPOSE

- To ensure constant packing pressure and both correct positioning of the packing arm at "reel empty" and the tripping of microswitch S5 at "reel full" conditions.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Remove the front and rear joining brackets, holding the intermediate handlers together,and only the side panel from the last unit.

2) - Adjust the 4 handler feet to lift the unit from the floor.

3) - Draw the unit out of its physical lay-out configuration position.

4) - Load an empty reel on the file reel hub.

5) - Position the packing arm shoe near the hub.

6) - Slacken the fixing set screws on the travel limiting collar.

7) - Keeping the end of the packing arm in contact with the hub, cause the limiting plate to contact the stop post.
Fully tighten the set screws leaving a shaft end-play of:

0.05 to 0.10 mm

8) - Moving the packing arm throughout its travel, no hard spots must be felt, otherwise check, or vary within limits, the shaft end-play of step 7.

9) - Bring the packing arm to the "reel full" position.

10) - Slacken the screw holding the S5 switch mounting plate.

11) - Position the plate so as the switch contacts close correctly, hence tighten the fixing screws.

12) - Remove the reel.

13) - Place the dynamometer as illustrated in fig. 4.4. and check for a 40 to 80 g load on the arm throughout its complete run.

14) - Replace the unit by repeating steps 3, 2 and 1 carrying out the operations in the reverse order.

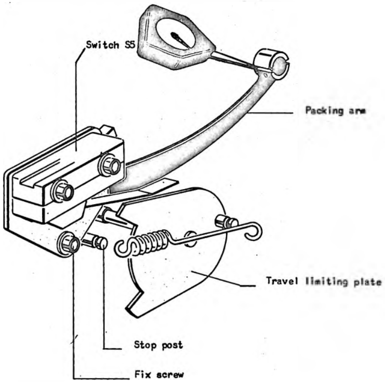


Fig. 4.4. - Packing arm adjustment

5 - FINAL CHECKS

- None.

ROUTINE : 4.5

NAME : Write inhibit group adjustment
DURATION : 0.2 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Gauge, vernier	P.N.	7250213 U
- Key, Allen 3 mm	"	7133130 Y
- Spanner, open ended 5.5 mm	"	4355327 Y
- Screwdriver blade 5 x 150	"	4355314 B
- Handle,universal	"	7138485 B
- Key, Allen 1.5 mm	"	0494140 Y

2 - PURPOSE

- To ensure positive operation of the relay and to prevent the write inhibit group plunger touching the write permissive ring.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Slacken the sensor plunger lock nut.

2) - Referring to fig. 4.5, rotate the plunger to have it protude:

3.5 mm

from the hub flange. Tighten the lock nut.

3) - Slacken the lock screw for the PS1 switch mounting bracket (it is located on the right hand side of the Power Supply chassis) and trip the switch to position 1.

4) - Switch the unit ON and check FILE PROTECT to be lit.

5) - Depress the sensor plunger and check FILE PROTECT to be out.

6) - Referring to fig. 4.6, loosen the 2 collars to free the respective thumb screws. Use the 1.5 mm Allen key as a tommy bar.

7) - Loosen the 2 Allen bolts fixing the terminal strip group.

8) - Turn the thumb screws to position the sensor plunger:

2 mm

away from the hub flange surface.

9) - Tighten the 2 Allen bolts, then the 2 thumb screws, hence lock the whole with the collars.

10) - Switch the unit OFF. Mount a reel with a write permissive ring fitted.

11) - Switch the unit ON and check for FILE PROTECT to be off.

12) - Remove the reel. Check that the relay is made and that a distance cf 2 mm is still satisfied between the sensor and the flange.

13) - Switch the unit OFF. Remove the reel. Set PS1 switch to position 0 fixing it in this position with its pertinent bracket.

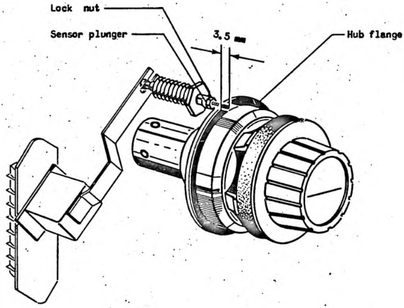


Fig. 4.5. - Sensor plunger adjustment

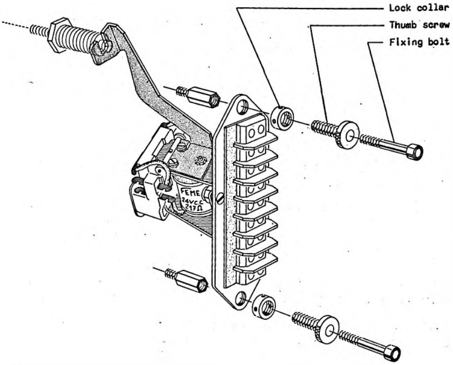


Fig. 4.6. – Write inhibit relay adjustment

5 – FINAL CHECKS

– None.

ROUTINE : 4.6

NAME : Capstan axial adjustment
DURATION : 0.15 hr
PREREQUISITES : Unit OFF; no tape loaded

1 - TOOLS AND INSTRUMENTS

- Spanner, peg	P.N.	0837504 D
- Spanner, open ended 17 mm	"	7133270 W
- Extractor	"	0842725 X
- Gauge, vernier	"	7250213 U

2 - PURPOSE

- To ensure the correct positioning of the capstan with respect to the tape.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Immobilize the capstan with the peg spanner. Rotate the split collar lock nut by 2 turns with the 17 mm spanner.

2) - Mount the extractor onto the capstan, turn clockwise the knurled collar to free the capstan from the split collar.

3) - Manually turn the lock nut to have the split collar up against the capstan. The group must be free to move on the capstan motor shaft.

4) - Position the group to have :

13.5 to 13.7 mm

between the casting reference edge and the outer capstan circumference.

Note

Whenever any part of the capstan group is moved, no traction or lateral forces must be applied to the capstan motor shaft. Any movement or positional adjustment is to be done manually without the aid of any tool whatsoever.

5) - Again immobilize the capstan with the peg spanner and tighten the split collar lock nut.

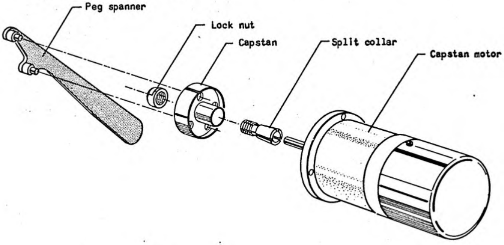


Fig. 4.7. - Capstan axial adjustment

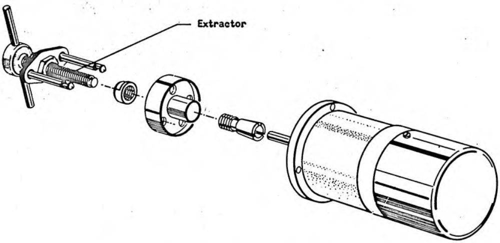


Fig. 4.8. - Capstan axial adjustment

5 - FINAL CHECKS

- Ensure that during tightening operations no variation on the tolerance given at step 4 has occurred, otherwise repeat the procedure to satisfy the requirements.

ROUTINE : 4.7

NAME : Tachometer lamp positional adjustment
DURATION : 0.25 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- Scope	Tektronix 422
- Screwdriver 6 mm blade	
- Allen key 1.5 mm	
- Jumper	

2 - PURPOSE

- To position the tachometer lamp, in the sector group, to obtain maximum phototransistor output.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Remove the fixing screws from the protective dome and withdraw it from the motor.

2) - For 18.75"/sec and 37.5"/sec MTHs :

  - connect the scope probe to point A or B of board PATO, physically located under the protective dome. Sync on AUTO internal.

  - For 75"/sec MTHs :

    - Remove the PWB protection and connect a scope probe to PWB PRET point C. Refer to fig. 4.9. a

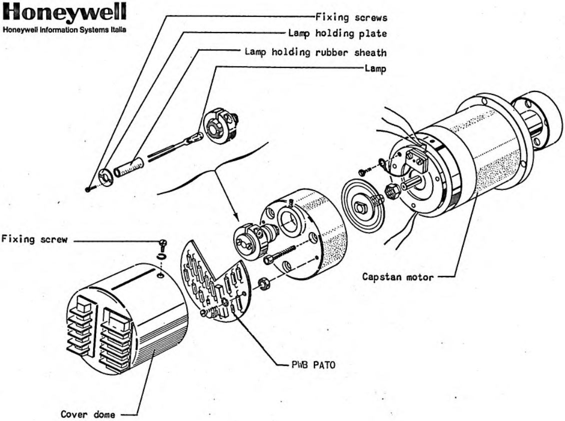


Fig. 4.9.b) - Tachometer lamp positional adjustment on 18.75"/sec and 37.5"/sec MTHs

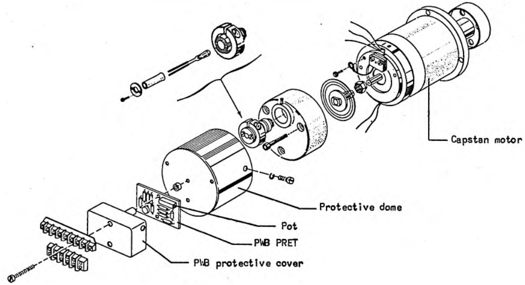


Fig. 4.9.c) - Tachometer lamp positional adjustment on 75"/sec MTHs

5 - FINAL CHECKS

- None.

ROUTINE : 4.8

NAME : Tachometer signal adjustment
DURATION : 0.25 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- Scope	Tektronix 422
- Screwdriver 6 mm blade	
- Small screwdriver	
- Jumper	

2 - PURPOSE

- To obtain a symmetrical tachometer signal (TAMA) as output from either board PATO or PRET.

3) - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - For 18.75"/sec and 37.5"/sec MTHs :

   - Remove the fixing screws from the protective dome and withdraw the dome from the motor.

   - For 75"/sec MTHs proceed as from step 2.

2) - Connect point A - 8 - 3 (MARE1), on GUN 150, to ground.

3) - Connect the scope probe to point A - 26 - 1. Sync on AUTO INT.

4) - Disconnect point P6 - 5A and P4 - 4A on MUN 140, to remove power from both reel motors.

5) - Switch the unit ON and press STAND-BY.

6) - Press LOAD. The capstan motor will turn.

7) - For 18.75"/sec and 37.5"/sec MTHs :

  - Trim pot on PATO PWB to scope a symmetrical square output waveform.
  - For 75"/sec MTHs :
    - Locate the pot on PWB PRET, through its protection and trim to obtain a symmetrical output waveform.

8) - Press STAND-BY and switch the unit OFF.

9) - Repeat steps 4, 3, 2 and 1, reversing the operations.

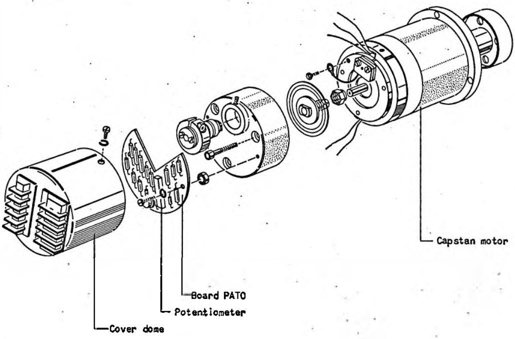


Fig. 4.10. - Tachometer signal adjustment

5 - FINAL CHECKS

- None.

ROUTINE : 4.9

NAME : S1 differential pneumatic switch adjustment
DURATION : 0.15 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Work tape	P.N.	4331077 T
- Open end wrench, 14-15 mm	"	7133260 V

2 - PURPOSE

- To ensure that when there is sufficient pressure in the vacuum bins, the handler goes in the STAND BY status and that when going into the Out of Service status and the reel brakes release, tape does not bottom out. The S1 switch is located under the fluorescent lamp.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Switch the unit ON and load the work tape.

2) - Press LOAD.

3) - If the handler does not go in OPERATE or STAND BY (depending upon whether the ON-OFF LINE switch in either in ON or OFF, respectively) because the S1 switch has not closed, rotate the adjustment nut anticlockwise.
Press LOAD again and repeat the adjustment if necessary. When operation is satisfactory, rotate the adjustment nut one further anticlockwise turn.

4) - Open the top bin cover and check that when the brakes release, the tape does not bottom out. If it does, further rotate the adjustment nut counterclockwise.

5) - Switch the unit OFF and unload the work tape.

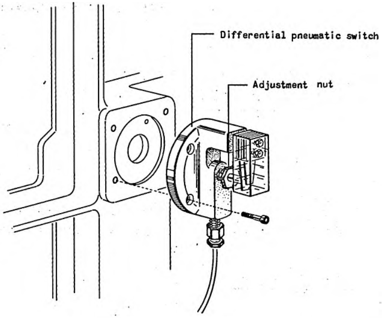


Fig. 4.11. – S1 differential pneumatic switch adjustment

5 – FINAL CHECKS

- None.

ROUTINE : 4.10

NAME : S2 and S3 pneumatic switches adjustment
DURATION : 0.15 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Work tape	P.N. 4331077 T
- Open end wrench, 14-15 mm	" 7133260 V

2 - PURPOSE

- To ensure that the unit goes in the Operating status when correct vacuum value is reached and the media is properly positioned.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Switch the unit ON and load the work tape.

2) - Press LOAD.

3) - If the unit does not go in OPERATE or STAND-BY (depending upon whether the ON-OFF LINE switch is either in ON or OFF, respectively) because switch S1 and/or S2 has not closed, rotate the adjustment nut counterclockwise.
Depress LOAD again and repeat the adjustment, if necessary, until the two switches trip, as near as possible, at the same time. When this is achieved, rotate the adjust nuts one further counterclockwise revolution.

4) - Switch the unit OFF and unload the work tape.

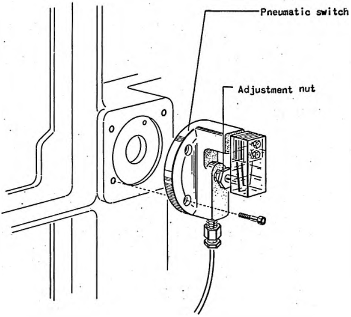


Fig. 4.12. - S2 and S3 pneumatic switches adjustment

5 - FINAL CHECKS

- None.

ROUTINE : **4.11**

NAME : Head to mu-shield distance adjustment
DURATION : 0.10 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Gauge	P.N. 0837309 W
Allen key 2.5 mm	

2 – PURPOSE

- To have the correct 0.3 mm distance between the magnetic head and its anti cross-talk shield (mu-shield).

3 – PRELIMINARY CHECKS

- None.

4 – PROCEDURE

1) – Slacken the 2 Allen screws fixing the mu-shield stop plate.

2) – Slide gauge P/N 0837309 W between the head and the mu-shield. Move the stop plate against the mu-shield and tighten the screws.

3) – Withdraw the gauge. It must be a sliding fit. If to the contrary, repeat steps 1 and 2.

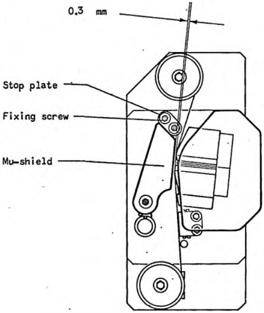


Fig. 4.13. – Head to mu-shield distance adjustment

5 – FINAL CHECKS

– None.

ROUTINE : 4. 12

NAME : Tape cleaners positional adjustment
DURATION : 0.15 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen key 2.5 mm
- Open end wrench -12 mm
- Work tape

2 - PURPOSE

- To prevent the tape cleaners from holding the tape in contact with the erase head.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Remove from the casting rear, the 2 protective head cover fixing screws, hence the cover.
2) - Disconnect the cleaners plastic suction tubes from the rear side of the precision plate.
3) - Switch the unit ON.
4) - Load the work tape and press LOAD.
5) - Slacken the fixing screws of both cleaners. Position them to be contacting and parallel with the tape. The tape must not be raised from the erase head. Tighten all 4 fixing screws.
6) - Repeat steps 4 through 1 carrying out the described operations in the reverse order.

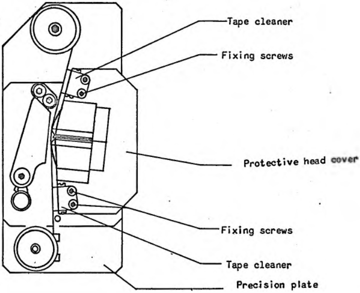


Fig. 4.14. – Tape cleaners positional adjustment

5 – FINAL CHECKS

- None.

ROUTINE : 4.13

NAME : Fluorescent lamp supply adjustment
DURATION : 0.30 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Multimeter
- Small screwdriver

2 - PURPOSE

- To adjust the lamp supply voltage, thus ensuring satisfactory servo reel motors operation.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Switch the unit ON.

2) - Allow about 15 minutes for the lamp to reach normal running conditions.

3) - Switch the meter to the 30 VDC scale. Put -ve lead on pin 5 of board B - 24 (SELA) and +ve lead on pin 17 (GND).

4) - Trim the SELA pot to read :

- 14.5 to - 15V

Note

The -14.5 to -15V level is an initial value and the minimum which may be set. The minimum value of -18 V may be reached for particular servo reel motor conditions.

5) – Repeat steps 3 and 1, carrying out the operations in the reverse order.

6) – Carry out Routine 4.14.

5 – FINAL CHECKS

– None.

ROUTINE :4. 14

NAME : Servo reel motors adjustment
DURATION : 0.45 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope	Tektronix 422
- Screwdriver 6mm blade	
- Small screwdriver	
- Work tape	

2 - PURPOSE

- To balance out the SEBO boards output signals when the tape is in the mid vacuum bin position.

3 - PRELIMINARY CHECKS

- Implement routine 4.13.

4 - PROCEDURE

1) - Switch the unit ON and load the work tape

2) - Open the upper bin cover.

3) - Await until pressure is no longer present in the bins.

4) - Manually rotate the tape reels and the capstan to move the tape loops to their mid-bin position. Refer to fig. 4.15a).

5) - Switch the unit off and disconnect contacts P6 -5A and P4-4A (yellow leads) to remove power from both reel motors, contact P7-10 (on ALI 040) for the capstan motor and contacts P6-7A and P4-2A for the brakes.

6) - Switch the unit on, press LOAD and then STAND-BY. Check the position of the tape loops and, if not correctly positioned, manually rotate the capstan.

7) - Rotate the 4 pots, on PWBs AB23 and AB22, counterclockwise to their quarter or mid slider run position.

8) - Connect the 2 scope channels to PWB AB23 (SEBO) pin 4' and 14'. Sync on LINE + AUTO, sweep frequency on 2 ms/cm and vertical scan on 2V/cm ALTERNATE.

9) – Rotate upper pot (RV1) clockwise until 2 pulses of equal duration and a 0 to 20V amplitude are on onputs 4' and 14'. Refer to fig. 4.15.

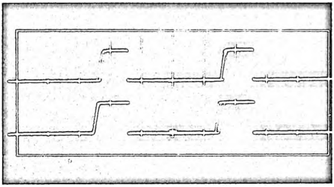


Fig. 4.15. – PWB SEBO output signal

10) – Turn lower pot (RV2) clockwise until the signals, on both outputs 4' and 14', simultaneously fall to 0V.

> **Note**
>
> If one of the two signals under exam disappears from the screen while the other remains stable, it will be necessary to touch-up the adjustment of RV1 until the faded signal comes back on and hence trim RV2 to have the practically simultaneous fall of the two signals.

11) – Manually rotate the capstan to position the left bin loop to the upper out-of-service sensor limit.
Check that +20 VDC is present on output 4' and 0 V at output 14'.

12) – Manually rotate the capstan to position the left bin loop to the lower out-of service sensor limit.
Check that 0 V is present on output 4' and +20 VDC at output 14'.

13) – If the requirements of steps 11 and 12 are not satisfied, electrically reconnect the reel brakes, further lower the tape in the bins (1 to 5 mm) and repeat the operations as from step 2.
Should the requirements of steps 9 and 10 be hard to meet, proceed to check the fluorescent lamp voltage and, if necessary, increase the supply. Refer to routine 4.13.

14) - Position both loops half way down the bins by manually turning the capstan. Connect the scope to pin 4' and 14' of board A - B - 22 (SEBO).

15) - Repeat the operations outlined in steps 9 and 10.

16) - Carry out the operations described at steps 11 and 12 for the right nand bin loop and obtain the same results.

17) - Disconnect scope from pins 4' and 14' of board A-B-22.
Switch the unit OFF.

18) - Restore power supply to the reel motors and brakes (connections: P4 - 4A, P6-5A, P4-2A, P6-7A) and to the capstan motor (P7-10 on the ALI 040).

19) - Push in the interlock microswitch plunger to its idle position, close the top bin cover and switch the unit ON. Remove the work tape and switch the unit OFF.

5 - FINAL CHECKS

- None.

ROUTINE : 4.15

NAME : +20 V and -20 V voltages adjustment
DURATION : 0.10 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Multimeter		
- Universal handle	P.N.	7138485 B
- Screwdriver blade 5 x 150	"	4355314 B
- Spanner, open ended 13 mm	"	7133250 U
- Spanner, open ended 11 mm	"	7133240 T

2 - PURPOSE

- To set the Data Electronics Module and Device Oriented Electronics supply voltages to their nominal values.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the positive and negative multimeter leads to the +20 V and GND sockets, located on the ALI 040 console.

2) - Loosen the RV2 lock nut and vary the pot to read $\boxed{+20\ V}$

3) - Tighten the RV2 lock nut.

4) - Connect the negative and positive multimeter leads to the -20 V and GND sockets.

5) - Loosen the RV1 lock nut and vary the pot to read $\boxed{-20\ V.}$

6) - Tighten the RV1 lock nut.

5 - FINAL CHECKS

- None.

ROUTINE : 4.16

NAME : Adjustment on +20 V protection
DURATION : 0.20 hr
PREREQUISITES : Routine 4.15.

1 - TOOLS AND INSTRUMENTS

- Multimeter		
- Screwdriver	P.N.	7131248 J
- Spanner, open ended 13 mm	"	7133250 U
- Universal handle	"	7138485 B
- Screwdriver blade 5 x 150	"	4355314 B
- Spanner, open ended 11 mm	"	7133240 T

2 - PURPOSE

- To obtain the protection call in upon voltage variations greater than ± 10%.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the multimeter positive lead to test-point L of boa 81 and the negative lead to GND jack on ALI 040 console. Set meter on 3 VDC scale.

2) - Vary pot RV7 on board TECA 81, to have a multimetor reading of approx :

$$\boxed{+0.7\ \text{V}}$$

3) - Connect negative lead to test-point N and positive one to GND jack.

4) - Vary pot RV8 to read approx :

$$\boxed{-0.7\ \text{V}}$$

5) - Connect positive lead to "+20V" jack and negative lead to GND jack. Set meter to 30 VDC scale.

6) - Slacken the lock nut on pot RV2 mounted on ALI 040 console. Turn pot clockwise and check that protection cuts in when the voltage level exceedes:

+22 V

If the protection cuts in early, turn TECA board pot RV7 counterclockwise. If it cuts in late, turn the same pot anticlockwise. Play on this pot to obtain the required protection value.

7) - Turn pot RV2 anticlockwise and check that the protection cuts in when the voltage value goes below :

+18 V

If the protection cuts in early, turn TECA board pot RV8 counterclockwise. If it cuts in late, turn the same pot clockwise. Play on this pot to obtain the required protection value.

8) - Carry out Routine 4.15, steps 1, 2 and 3.

5 - FINAL CHECKS

- None.

ROUTINE : 4.17

NAME : Adjustment on -20 V protection
DURATION : 0.20 hr
PREREQUISITES : Routine 4.15

1 - TOOLS AND INSTRUMENTS

- Multimeter		
- Screwdriver	P.N.	7131248 J
- Spanner, open ended 13 mm	"	7133250 U
- Universal handle	"	7138485 B
- Screwdriver blade 5 x 150	"	4355314 B
- Spanner, open ended 11 mm	"	7133240 T

2 - PURPOSE

- To obtain the protection call in upon voltage variations greater than ± 10%.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the multimeter negative lead to test point M of board TECA 81 and the positive lead to GND jack on ALI 040 console.
Set meter on 3 VDC scale.

2) - Vary pot RV9 on board TECA 81 to have a multimeter reading of approx:

-0,7 V

3) - Connect positive lead to test point 1 and negative one to GND jack.

4) - Vary pot RV6 to read approx:

+0,7 V

5) - Connect negative lead to "-20V" jack on ALI 040 console and positive lead to the GND jack. Set meter scale to 30 VDC.

6) - Slacken the lock nut on pot RV1 mounted on ALI 040 console. Turn pot clockwise and check that the protection cuts in when the voltage value exceeds :

-22 V

If the protection cuts in early, turn TECA PWB pot RV9 ,clockwise. If it cuts in late, turn the same pot anticlockwise. Play on this pot to obtain the required protection value.

7) - Turn pot RV1 anticlockwise and check that the protection cuts in when the voltage value goes below :

-18 V

If the protection cuts in early, turn pot RV6 , anticlockwise. If it cuts in late, turn the same pot clockwise. Play on this pot to obtain the required protection value.

8) - Carry out Routine 4.15. steps 4, 5 and 6.

5 - FINAL CHECKS

- None.

ROUTINE : 4.18

NAME : Power sequencing delay adjustment
DURATION : 0.10 hr
PREREQUISITES : None

1 – TOOLS AND INSTRUMENTS

- Multimeter

2 – PURPOSE

- To prevent application of noise to the DEM at the moment of switch on.

3 – PRELIMINARY CHECKS

- None.

4 – PROCEDURE

1) – Connect the multimeter positive lead to pin 08 on board E – 06 and the negative lead to pin 17.
Set meter on 30 VDC scale.

2) – Set the graduated slider in position 3 or 4 (sec).

3) – Switch the unit ON and check that the meter needle moves after about 3 to 4 seconds from the switch-on instant. If this requirement is not satisfied vary, accordingly, the position of the slider.

4) – Disconnect the meter and switch the unit OFF.

5 – FINAL CHECKS

- None.

ROUTINE : 4.19

CANCELLED

ROUTINE : 4.20.

NAME : Capstan speed adjustment
DURATION : 0.25 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N	0646704 R
- Field-tester cable	"	0640101 S
- Small screwdriver		
- Work tape		

2 - PURPOSE

- To adjust the capstan speed to obtain rated RPM conditions.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to the GUN 150 J10 connector.

2) - Connect up the scope ground and its inputs to Field tester jacks GND, INT and EXT, respectively.

3) - Switch the unit ON, load the work tape and press LOAD hence set the ON/OFF LINE switch to OFF.

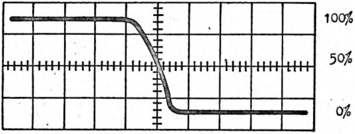
4) - Press ON-RESET on the Field-tester and set its controls as per following table .

FUNCTION	POSITION
REV-FWD	FWD
GO-STOP-START/STOP	GO
75 IPS - 18.75/37.5 IPS	18.75/37.5 IPS for MTH 18.75 and 37.5"/sec. 75 IPS for MTH 75"/sec.

5) - Allow a few yards of tape to unwind and, by alternatively switching REV-FWD, cause the tape to move back and forth.

6) - Sync scope on positive INT. Switch to Field-tester EXT socket and centre the whole waveform on the screen.

7) - Rotate POCA board (A-B-18) pot RV3 (3rd from top) to have an equal signal period, at the leading edges mean point, in both drive directions.



8) - Spread the sweep freq. by X10 to fine adjust settings of step 7.

9) - Set the REV-FWD switch to FWD. Annul the X10 magnification.

10) - Focus in both signals present on Field-tester jacks EXT and INT and vary the pot on board A - 21 (UNAP) clockwise, to increase TEXT. The adjustment must be such that the relationship between the reference signal TINT and the tachometer signal TEXT is, at 50% of the leading edges, as shown in the following table.

TAPE SPEED	RELATIONSHIP
18.75"/sec	TEXT = 2 TINT
37.5" /sec	TEXT = TINT
75" /sec	TEXT = TINT

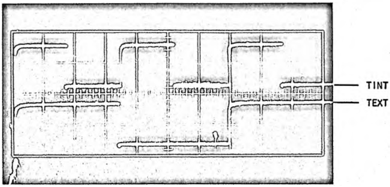
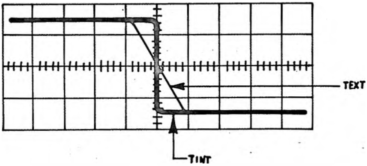


Fig. 4.16. - Tachometer and reference signals -18.75"/sec MTH

11) - Spread the sweep freq. by X 10 and fine adjust setting of point 10.



12) - Depress STOP and then REW-UNLOAD to fully rewind the tape.
13) - Switch the unit OFF and disconnect the Field-tester cable.

5 - FINAL CHECKS

- None.

ROUTINE : 4.21.

NAME : Rewind speed adjustment
DURATION : 0.25 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N	0646704 R
- Field-tester cable	"	0640101 S
- Small Screwdriver		
- Work tape		

2 - PURPOSE

- Adjust the rewind speed to obtain rated speed conditions.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to the GUN 150 J10 connector.

2) - Connect up the scope ground and its inputs to Field-tester jacks GND, INT and EXT, respectively.

3) - Switch the unit ON, load the work tape and press LOAD hence set the handler ON/OFF LINE switch to OFF.

4) - Set Field-tester controls as per following table and therefore depress its ON RESET button.

FUNCTION	POSITION
REV-FWD	FWD
GO-STOP-START/STOP	GO
75 IPS - 18.75/37.5 IPS	18.75/37.5 IPS for MTH at 18.75 and 37.5"/sec 75 IPS for MTH at 75"/sec.

5) - Allow about a quarter of the reel to unwind.

6) - Stop the tape with STOP and press REW.

7) - Sync scope on negative INT. Switch to EXT socket and centre the whole waveform on the screen.

8) - Turn pot RV4 (4th from top) on board A - B - 18 (POCA) to have the signal period equal to :

4.2 to 4.6 μs	18.75"/sec and 37.5"/sec MTHs
10.5 to 11.5 μs	75"/ sec MTHs

9) - When the tape has fully rewound, remove the work tape, switch the unit OFF and disconnect the Field-tester cable.

5 - FINAL CHECKS

- None.

ROUTINE : 4.22.

NAME : START-STOP times adjustments
DURATION : 0.50 hr
PREREQUISITES : None.

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Screwdriver	"	7131248 J
- Work tape	"	4331077 T

2 - PURPOSE

- To ensure that both rated drive speed and tape movement halt within the functional specifications.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to connector J10 of the GUN 150.

2) - Switch the unit ON, load the work tape and press LOAD, hence set the ON/OFF LINE switch to OFF.

3) - Set the Field-tester controls as per following table and therefore depress its ON-RESET button.

FUNCTION	POSITION
REV-FWD	FWD
READ-WRITE	WRITE
BIT-SWITCH (1 to 9)	"1"
IPS/BPI	18.75/800 for MTH 18.75"/sec 37.5 /800 for MTH 37.5" /sec 75/ 800 for MTH 75"/sec
GO-STOP-START/STOP	GO
MISE	"1"

4) - Allow about half the reel to unwind therefore depress STOP. Set the WRITE-READ switch to READ and hence depress REW.

5) - When the tape has fully rewound, connect the scope ground and a channel to the Field-tester jacks GND and READ DIRECT.
Connect the scope EXT sync. to Field tester jack GO-SYNC.

6) - Set Field-tester controls as per following table.

FUNCTION	POSITION
REV-FWD	FWD
READ-REV	OFF
READ-WRITE	READ
IPS/BPI	18.75/800 for 18.75"/sec MTH 37.5 /800 for 37.5" /sec MTH 75/800 for 75"/sec MTH
S20	PM/NRZ-NRZ
100 ms - 10 ms - 1 sec	100 ms
READ-SCAN	1 to 9*
GO-STOP-START/STOP	START/ STOP

* Seven track handlers do not utilize positions 7 and 8.

7) - Allow a few yards of tape to unwind. Sync on GO-SYNC negative going edge and, by alternatively switching REV-FWD, cause the tape to go back and forth.

8) - Turn pot RV2 (2nd from top) on board A - B - 18 (POCA) to have the signal envelope equal for both directions of drive.

9) - Turn pot RV1 (1st from top) on board A - B - 18 (POCA) clockwise, to increase, or anticlockwise, to decrease the START time.
Trim said pot to obtain :

SPEED	START TIME
18.75"/sec	3.5 ms
37.5" /sec	5 ms
75"/ sec	5 ms

10) - Set the REV-FWD switch to FWD. Sync on GO-SYNC positive going edge.

11) - Vary the lower pot of board B - 21 (UNIV) to adjust the timing of signal USTO. The envelope slopes of the signal must be symmetrical. If the signal is under-dampened, the STOP time (USTO) will result too short. If once the envelope has reached the zero mean value it picks up again, it means that drive has inverted and that the time of USTO is too long and thus over dampened. The STOP time must be :

SPEED	STOP TIME
18.75"/sec	2 to 3 ms
37.5" /sec	3.5 to 4.5 ms
75" /sec	3.5 to 4.5 ms

12) - Set the REV-FWD switch to REV. Check that the envelope of the signal is symmetrical and that the damping degree is correct. The STOP time must be as specified in the table given in step 11 above. If the requirements are not satisfied, repeat steps 7, 8, 9, 10 and 11.

13) - Stop the tape with STOP and rewind with REW-UNLOAD.

14) - When the tape has fully rewound, remove the work tape, switch the unit OFF and disconnect the Field-tester cable.

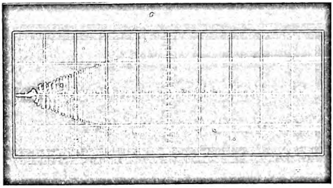


Fig. 4.17. - START envelope

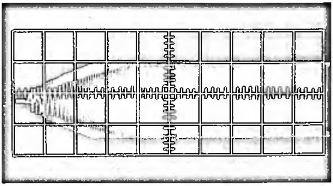


Fig. 4.18. - Unequal START envelopes

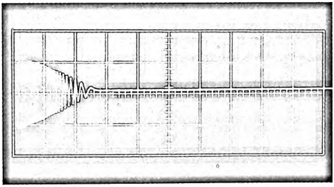


Fig. 4.19. - STOP envelope

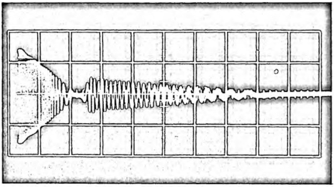


Fig. 4.20. - STOP envelope/over-dampened

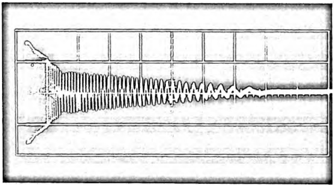


Fig. 4.21. - STOP envelope/under-dampened

5 - FINAL CHECKS

- None.

ROUTINE : 4.23.

NAME : Preamplifiers gain adjustment on PM handlers
DURATION : 0.30 hr
PREREQUISITES : Routine 1.1

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Master Output Standard Signal Level Tape	"	4355466 S
- Small screwdriver		

2 - PURPOSE

- To set signals amplitude to the level accepted by the Data Electronics Module.

3 - PRELIMINARY CHECKS

- Check scope vertical amplifier calibration.

4 - PROCEDURE

1) - Connect the Field-tester cable to the GUN 150 J10 connector.

2) - Connect the scope ground and a channel to the Field-tester jacks GND and READ DIRECT, respectively.

3) - Switch the unit ON, mount either the Master Output Standard Signal Level tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - Set the Field-tester controls as per the table shown in the following page,hence press its ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
BIT-SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI SELECTOR	18.75/1600 for MTH 18.75"/sec 37.5 /1600 for MTH 37.5" /sec 75 / 1600 for MTH 75" /sec
REV-FWD	FWD
S20	PM
MISE	1
GO-STOP-START/STOP	GO

5) – Sequentially rotate the READ SCAN rotary switch bringing signal amplitude to $\boxed{1.9 \text{ to } 2.1 \text{ V ptp}}$ by trimming pot on boards PAMI (in the GUN 150) clockwise to increase and anticlockwise to decrease. Track to pot position relationship is given in the following table.

TRACK	PAMI SLOT
1	E - 12
2	E - 14
3	E - 16
4	E - 18
5	E - 20
6	E - 22
7	E - 24
8	E - 26
9	E - 28

6) – Stop the tape with STOP and rewind with REW-UNLOAD.

7) – When the tape has fully rewound, remove the work tape, switch the unit OFF and disconnect the Field-tester cable.

5 – FINAL CHECKS

– None.

ROUTINE : 4.24

NAME : Write alignment adjustment on PM handlers
DURATION : 0.50 hr
PREREQUISITES : Routines 1.1 and 4.19

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Master Skew Tape Full Width 800 bpi	"	4355479 Q
- Work tape		
- Small screwdriver		

2 - PURPOSE

- To obtain that all character bits be written along an axis perpendicular to the tape edge.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to connector J10 of the GUN 150.

2) - Connect the scope ground and a channel to the Field-tester jacks GND and READ PULSE. Connect scope EXT sync input to READ-DIRECT jack n° V (I to IX).

3) - Switch the unit ON, mount the Master Skew Tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - Rotate the 9 Field Tester READ SCAN ADJ column pots to their complete counterclockwise position.

5) - Set the Field-tester controls as per the table shown on the following page, then press the ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
READ-WRITE	READ
REV-FWD	FWD
IPS/BPI SELECTOR	18.75/800 for 18.75"/sec MTH
	37.5 /800 for 37.5" /sec MTH
	75/800 for 75"/sec MTH
S20	PM
GO-STOP-START/STOP	GO

6) - Sync the scope to EXT AUTO, pos. going edge and focus the three pulses of the signal tapped from the READ PULSE jack with the READ SCAN switch set on position 6.
Magnify the sweep freq. by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync on this track (READ DIRECT jacks, I to IX).

7) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, rotate the READ-SKEW ADJ pots clockwise.

8) - Depress STOP then slowly rewind with REV-FWD set to REV.

9) - When the Master Skew Tape has fully rewound, remove it and mount the work tape. Depress LOAD.

10) - Sync scope on the trailing edge of signal RETE (H-06-04 GUN 150) and set the Field Tester controls as follows :

FUNCTION	POSITION
REV-FWD	FWD
BIT SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI	18.75/800 for 18.75"/sec MTH
	37.5 /800 for 37.5" /sec MTH
	75/800 for 75" /sec MTH
READ-REV	OFF
GO-STOP-START/STOP	GO
S20	PM

- Depress ON RESET. Connect a scope channel on pin 1 of every URES PWB housed in the GUN 150 locations shown below.
  Appropriately rotate each PWB pot to obtain the minimum delay(registering the required sense of rotation) and, once this delay has been obtained, rotate the pots for 2 full turns in the opposite sense.

TRACK	URES SLOT
1	H - 06
2	H - 07
3	H - 08
4	H - 09
5	H - 10
6	H - 11
7	H - 12
8	H - 13
9	H - 14

11) - Connect scope EXT sync input to READ DIRECT jack No. V (I to IX).

12) - Set the Field-tester controls as per following table.

FUNCTION	POSITION
READ-REV	OFF
BIT-SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
REV-FWD	FWD
IPS/BPI SELECTOR	18.75/800 for 18.75"/sec MTH
	37.5 /800 for 37.5" /sec MTH
	75 / 800 for 75"/sec MTH
S20	PM
MISE	0
GO-STOP-START/STOP	GO

13) - Sync on EXT AUTO trailing edge and focus-in the three pulses of the signal tapped from the READ PULSE jack with the READ SCAN switch set on position 6.
Magnify the sweep freq. by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync on this track (READ DIRECT jacks, I to IX).

ROUTINE : 4.25

NAME : Read alignment adjustment on PM + NRZI handlers
DURATION : 0.50 hr
PREREQUISITES : Routines 1.1 and 4.19.

1 – TOOLS AND INSTRUMENTS

– Scope		Tektronix 422
– Field-tester (VAR 600)	P.N.	0646704 R
– Field-tester cable	"	0640101 S
– Master Skew Tape Full Width 800 bpi	"	4355464 J

2 – PURPOSE

- To electronically compensate static skew between the various read head tracks, so as to obtain a simultaneous reading of all the bits making up one character.

3 – PRELIMINARY CHECKS

- None.

4 – PROCEDURE

1) – Connect the Field-tester cable to the GUN 150 J10 connector.

2) – Connect up the scope ground and its channels to Field Tester jacks GND, READ-DIRECT and READ PULSE respectively. Connect scope EXT sync input to READ-DIRECT jack No. V (I to IX).

3) – Switch the unit ON, mount the Master Skew Tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) – By pass the PARI delay lines by linking pin 01 to pin 04, 02 to 05 and 06 to 17.

5) – Set the Field-tester controls as per following table, and therefore press its ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
READ-WRITE	READ
IPS/BPI SELECTOR	18.75/800 for MTH 18.75"/sec 37.5 /800 for MTH 37.5" /sec 75 /800 for MTH 75"/ sec
REV-FWD	FWD
S20	PM/NRZ-NRZ
MISE	0
GO-STOP-START/STOP	GO

6) - With scope sync on INT AUTO, check the amplitude of the various track signals present on the READ DIRECT jack, by switching READ SCAN from 1 through to 9. Set signal amplitude to $\boxed{\text{1.7 to 1.9 V ptp}}$ by trimming the upper pot on boards PARI (in the GUN 150) clockwise to increase and anticlockwise to decrease.
Track to pot position relationship is given in the following table.

TRACK	PARI SLOT
1	E - 13
2	E - 15
3	E - 17
4	E - 19
5	E - 21
6	E - 23
7	E - 25
8	E - 27
9	E - 29

7) - With scope sync on EXT AUTO negative going edge, focus in the 3 pulses of the signal drawn from the READ PULSE jack, with the READ SCAN switch in position 6.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync to this track (READ DIRECT jacks I to IX).

8) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, connect pin 02, of the PARI boards alignment connectors, to any pin between 07 and 17.

9) - Set the FWD-REV switch to REV and cancel the X10 time axis magnification.

10) - With scope sync on INT AUTO, check the amplitude of the various track signals. Tap signals from READ DIRECT selecting the track with READ SCAN. Adjust signal level to $\boxed{\text{1.7 to 1.9 V ptp}}$ by turning the lower pot on boards PARI, clockwise to increase and anticlockwise to decrease. See table at step 6.

11) - Connect scope EXT sync to READ DIRECT jack No. V (I to IX).

12) - With scope sync on EXT AUTO pos. going edge, focus-in the 3 pulses of the signal drawn from the READ PULSE jack, with the READ SCAN switch in position 6.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync to this track (READ DIRECT jack, I to IX).

13) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, connect pin 01, of the PARI boards alignment connectors, to any pin between 07 and 17.
Should a pin not be available, use floating pins 04,05 and 06.

14) - Depress STOP then slowly rewind with REV-FWD set to R EV.

15) - When the tape has fully rewound, remove the work tape and carry-out Routines 4.26 and 4.27.

5 - FINAL CHECKS

- None.

ROUTINE : 4.26

NAME : Preamplifiers gain adjustment on PM + NRZI handlers
DURATION : 0.30 hr
PREREQUISITES : Routine 1.1

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Master Output Standard Signal Level Tape	"	4355466 S
- Small screwdriver		

2 - PURPOSE

- To set signals amplitude to the level accepted by the Data Electronics Module.

3 - PRELIMINARY CHECKS

- Check scope vertical amplifier calibration.

4 - PROCEDURE

1) - Connect the Field-tester cable to connector J10 of the GUN 150.

2) - Connect the scope ground and an channel to the Field-tester jacks GND and READ DIRECT, respectively.

3) - Switch the unit ON, mount either the Master Output Standard Signal Level tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - Set the Field-tester controls as per table shown on the following page, after which press its ON-RESET button .

FUNCTION	POSITION
READ-REV	OFF
BIT-SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI SELECTOR	18.75/1600 for MTH 18.75"/sec
	37.5 /1600 for MTH 37.5" /sec
	75 /1600 for MTH 75"/ sec
REV-FWD	FWD
S20	PM/NRZ-NRZ
MISE	1
GO-STOP-START/STOP	GO

5) – Sequentially rotate the READ SCAN rotary switch checking signal amplitude. Set signal level to 1.9 to 2.1 V ptp by trimming pot on boards PAMI (in the GUN 150) clockwise to increase and anticlockwise to decrease.
Track to pot position relationship is given in the following table.

TRACK	PAMI SLOT
1	E - 12
2	E - 14
3	E - 16
4	E - 18
5	E - 20
6	E - 22
7	E - 24
8	E - 26
9	E - 28

6) – Stop the tape with STOP and position the IPS/BPI SELECTOR switch to one of the following settings :

- 18.75/800 for handlers at 18.75"/ sec
- 37.5 /800 for handlers at 37.5" / sec
- 75 /800 for handlers at 75" / sec

then position switch MISE to 0.

7) - Depress GO to start tape movement and check signal amplitude on all the various tracks by rotating the READ SCAN switch from position 1 to 9.
Turn the upper pot on the PARI boards (clockwise to increase and anticlockwise to decrease) setting the signals to 1.9 to 2.1 V ptp for forward mode operation.
Track to pot position relationship is given in the following table.

TRACK	PARI SLOT
1	E - 13
2	E - 15
3	E - 17
4	E - 19
5	E - 21
6	E - 23
7	E - 25
8	E - 27
9	E - 29

Set the READ REV switch to the ON position. Rotate the READ SCAN switch from position 1 to 9 to select the various track signals.
Turn the lower pot on the PARI boards (clockwise to increase and anticlockwise to decrease) setting the signals to 1.9 to 2.1 V ptp, for reverse mode operation.

8) - Stop the tape with STOP and rewind with REW UNLOAD.

9) - When the tape has fully rewound, remove the reel.
If Routine 4.25 had been implemented before this adjustment, also carry out Routine 4.27, otherwise switch the unit OFF and disconnect the Field Tester cable.

5 - FINAL CHECKS

- None.

ROUTINE : 4.27

NAME : Write alignment adjustment on PM + NRZI handlers
DURATION : 0.50 hr
PREREQUISITES : Routines 4.25 and 4.26

1 - TOOLS AND INSTRUMENTS

– Scope		Tektronix 422
– Field-tester (VAR 600)	P.N.	0646704 R
– Field-tester cable	"	0640101 S
– Small screwdriver		
– Work tape		

2 - PURPOSE

- To obtain that all character bits be written along an axis perpendicular to the tape edge.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to connector J10 of the GUN 150.

2) - Switch the unit ON, mount the Work tape and press LOAD. Set the ON/OFF LINE switch to OFF.

3) - Set the Field-Tester according to the following table.

FUNCTION	POSITION
REV-FWD	FWD
BIT-SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI	18.75/800 for 18.75"/sec MTH
	37.5 /800 for 37.5" /sec MTH
	75/800 for 75"/sec MTH
READ-REV	OFF
GO-STOP-START/STOP	GO
S20	PM/NRZ-NRZ

- Depress ON RESET and sync scope on the trailing edge of signal RETE (H-06-04 GUN 150). Connect a scope channel on pin 1 of every URES PWB housed in the GUN 150 locations shown below.
  Appropriately rotate each PWB pot to obtain the minimum delay (registering the required sense of rotation) and, once this delay has been obtained, rotate the pots for 2 full turns in the opposite sense.

TRACK	URES SLOT
1	H - 06
2	H - 07
3	H - 08
4	H - 09
5	H - 10
6	H - 11
7	H - 12
8	H - 13
9	H - 14

4 - Connect the scope ground and a channel to Field Tester Jacks GND and READ PULSE. Connect scope EXT sync input to jack READ DIRECT No. V (I to IX).

5 - Set the Field-tester according to the following table.

FUNCTION	POSITION
READ-REV	OFF
READ-WRITE	WRITE
IPS/BPI SELECTOR	18.75/800 for 18.75"/sec MTH
	37.5 /800 for 37.5"/ sec MTH
	75 /800 for 75" / sec MTH
FWD-REV	FWD
S20	PM/NRZ-NRZ
MISE	0
GO-STOP-START/STOP	GO

6) - With scope sync on EXT AUTO negative going edge, focus in the three pulses of the signal drawn from the READ PULSE jack, with the READ SCAN switch in position 6.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay.
Shift sync to this track (READ DIRECT jack, I to IX).

7) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, rotate the URES one-shot pots in the opposite sense as to the sense required and registered in step 4.
Check the time spread of each URES output signal (PWB pin 1) to be :

⩽ 14/us	18.75"/sec MTH
⩽ 7/us	37.5" /sec MTH
⩽3.5/us	75"/ sec MTH

Should any of the one-shots not meet the requirement, proceed as follows :

a - Set the one-shots to their minimum delay once more, as described in step 4.

b - heck that the selected sync track is, in effect, the one having the greatest delay.

If, even after these checks, the one-shot time spreads still do not correspond, it is advisable to leave the involved sync track misaligned but have the one-shot time spread within the limits.

8) - Stop the tape with STOP and rewind with REW-UNLOAD.

9) - When the tape has fully rewound, remove the reel, switch the unit OFF and disconnect the Field-tester cable.

5 - FINAL CHECKS

- None.

ROUTINE : 4.28

NAME : Read alignment adjustment on 7 track NRZI handlers
DURATION : 0.30 hr
PREREQUISITES : Routines 1.1 and 4.19.

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Master Skew Tape Full Width 800 bpi	"	4355464 J
- Small screwdriver		

2 - PURPOSE

- To electronically compensate static skew between the various read head tracks, so as to obtain simultaneous reading of all the bits making up one character.

3 - PRELIMINARY CHECKS

- Check scope vertical amplifier calibration.

4 - PROCEDURE

1) - Connect the Field-tester cable to the GUN 150 J10 connector.

2) - Connect up the scope ground to Field-tester GND and the scope channels to the READ DIRECT and READ PULSE jacks. Connect scope EXT sync input to READ DIRECT jack No. IV (I to VII).

3) - Switch the unit ON, mount the Master Skew Tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - By pass the PARI delay lines by linking pin 01 to pin 04, 02 to 05 and 06 to 17.

5) - Set the Field-tester controls as per following table, after which, press the Field Tester ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
READ-WRITE	READ
IPS/BPI SELECTOR	18.75/800 for MTH 18.75"/sec 37.5 /800 for MTH 37.5" /sec 75/800 for MTH 75" /sec
REV-FWD	FWD
S20	PM/NRZ-NRZ
MISE	0
GO-STOP-START/STOP	GO

6) - With scope sync on INT AUTO, check the amplitude of the various track signals present on the READ DIRECT jack, by switching READ SCAN from 1 through to 9. Set signal level to $\boxed{\text{1.7 to 1.9 V ptp}}$ by trimming the upper pot on boards PARI (in the GUN 150) clockwise to increase and anticlockwise to decrease (forward mode operation).
Track to pot position relationship is given in the following table.

TRACK	PARI SLOT
1	E - 13
2	E - 15
3	E - 17
4	E - 19
5	E - 21
6	E - 23
7	E - 25

7) - With scope sync on EXT AUTO positive going edge, focus - in the 3 pulses of the signal drawn from the READ PULSE jack, with the READ SCAN switch in position 4.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync to this track (READ DIRECT jack, I to VII).

8) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, connect the PARI boards alignement connectors pin 02 to any pin between pin 07 and 17.

9) - Set the FWD-REV to REV and cancel the X10 time axis magnification.

10) - With scope sync on INT AUTO, check the amplitude of the various track signals. Tap signals from READ DIRECT and select track with READ SCAN. Adjust signal level to 1.7 to 1.9 V ptp by turning the lower pot on boards PARI (clockwise to increase and anticlockwise to decrease - Reverse mode). See table at step 6.

11) - Connect scope EXT sync to READ DIRECT jack No. IV (I to VII).

12) - With scope sync on EXT AUTO negative going edge , focus - in the 3 pulses of the signal drawn from the READ PULSE jack, with the READ SCAN switch in position 4.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync to this track (READ DIRECT jack, I to VII).

13) - Delay all track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, connect pin 01, of the PARI boards alignment connectors, to any pin between pin 07 and 17.
Should a pin not be available use floating pins 04, 05 and 06.

14) - Set FWD-REV control to REV and hence rewind at SLOW speed.

15) - When the tape has fully rewound, remove the reel and caary out Routine 4.29 and 4.30.

5 - FINAL CHECKS

- None.

ROUTINE : 4.29

NAME : Preamplfiers gain adjustment on 7 track NRZI handlers
DURATION : 0.30 hr
PREREQUISITES : Routine 1.1

1 - TOOLS AND INSTRUMENTS

- Scope		Tektronix 422
- Field-tester (VAR 600)	P.N.	0646704 R
- Field-tester cable	"	0640101 S
- Master Output Standard Signal Level Tape	"	4355466 S
- Small screwdriver		

2 - PURPOSE

- To set signals amplitude to the level accepted by the Data Electronics Module.

3 - PRELIMINARY CHECKS

- Check scope vertical amplifier calibration.

4 - PROCEDURE

1) - Connect the Field-tester cable to connector J10 of the GUN 150.

2) - Connect the scope ground and an channel to the Field-tester jacks GND and READ DIRECT, respectively.

3) - Switch the unit ON, mount either the Master Output Standard Signal Level tape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - Set the Field-tester controls as per table shown on the following page, after which press its ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
BIT-SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI SELECTOR	18.75/ 20 for 18.75"/sec MTH 37.5 / 20 for 37.5" /sec MTH 75 / 20 for 75"/sec MTH
REV-FWD	FWD
S20	PM/NRZ-NRZ
MISE	1
GO-STOP-START/STOP	GO

5) - Sequentially rotate the READ SCAN rotary switch checking signal amplitude. Set signal level to 1.9 to 2.1 V ptp by trimming pot on boards PAMI (in the GUN 150) clockwise to increase and anticlockwise to decrease.
Track to pot position relationship is given in the following table.

TRACK	PAMI SLOT
1	E - 12
2	E - 14
3	E - 16
4	E - 18
5	E - 20
6	E - 22
7	E - 24

6) - Stop the tape with STOP and then set switch MISE to 0.

7) - Depress GO to start tape movement and check signal amplitude on all tracks by rotating the READ SCAN switch from position 1 to 9 (positions 7 and 8 are not utilized).
Turn the upper pot on the PARI boards (clockwise to increase and anticlockwise to decrease) setting signals to 1.9 to 2.1 V ptp for forward mode operation.
Track to pot position relationship is given in the following table.

TRACK	PARI SLOT
1	E - 13
2	E - 15
3	E - 17
4	E - 19
5	E - 21
6	E - 23
7	E - 25

8) - Set the READ REV switch to ON and check signal amplitude on all tracks by rotating the READ SCAN switch from position 1 to 9 (positions 7 and 8 are not utilized).
Turn the lower pot on the PARI boards(clockwise to increase and anticlockwise to decrease) to set signal level to 1.9 to 2.1 V ptp for reverse mode operation. See table at step 7.

9) - Stop the tape with STOP and rewind with REW-UNLOAD.

10) - When the tape has fully rewound, remove the reel.
If Routine 4.28 had been implemented before this adjustment, also carry out Routine 4.30, otherwise switch the unit OFF and disconnect the Field-tester cable.

5 - FINAL CHECKS
- None.

ROUTINE : 4.30

NAME : Write alignment adjustment on 7 track NRZI handlers
DURATION : 0.50 hr
PREREQUISITES : Routines 4.28 and 4.29

1 - TOOLS AND INSTRUMENTS

- Scope	P.N.	Tektronix 422
- Field-tester (VAR 600)	"	0646704 R
- Field-tester cable	"	0640101 S
- Screwdriver	"	7131248 J
- Work tape	"	4331077 T

2 - PURPOSE

- To obtain that all character bits be written along an axis perpendicular to the tape edge.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Connect the Field-tester cable to the GUN 150 connector J10.

2) - Connect the scope ground and a channel to the Field-tester jacks GND and READ PULSE. Connect scope EXT sync input to READ-DIRECT jack IV (I to VII).

3) - Switch the unit ON, mount the worktape and press LOAD. Set the ON/OFF LINE switch to OFF.

4) - Sync scope on the trailing edge of signal RETE (H-06-04 GUN 150)and set the Field-Tester controls as per table shown on the following page.

FUNCTION	POSITION
REV-FWD	FWD
BIT SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI	18.75/800 for 18.75"/sec MTH 37.5 /800 for 37.5" /sec MTH 75/800 for 75"/sec MTH
READ-REV	OFF
GO-STOP-START/STOP	GO
S20	PM/NRZ-NRZ

- Depresss ON RESET. Connect a scope channel on pin 1 of every URES PWB housed in the GUN 150 locations shown below.
  Appropriately rotate each PWB pot to obtain the minimum delay(registering the required sense of rotation) and, once this delay has been obtained, rotate the pots for 2 full turns in the opposite sense.

TRACK	URES SLOT
1	H - 06
2	H - 07
3	H - 08
4	H - 09
5	H - 10
6	H - 11
7	H - 12

5) - Set the Field-Tester controls as per following table and then depress the ON-RESET button.

FUNCTION	POSITION
READ-REV	OFF
BIT SWITCH (1 to 9)	"1"
READ-WRITE	WRITE
IPS/BPI SELECTOR	18.75/800 for 18.75"/sec MTH 37.5 /800 for 37.5" /sec MTH 75 /800 for 75" /sec MTH
S20	PM/NRZ-NRZ
MISE	0
GO-STOP-START/STOP	GO

6) - With sync EXT AUTO, negative going edge, focus in the three pulses of the signal tapped from the READ PULSE jack with the READ SCAN switch set on position 4.
Magnify the time axis by X10 and fetch in the first pulse at the centre of the scope graticule. Turn the READ SCAN switch to find the track with the greatest delay. Shift sync on this track (READ DIRECT jacks, I to VII).

7) - Delay all the track signals, with the exception of the sync track, to cause all the clocks to coincide with the sync clock.
To obtain this, rotate the GUN 150 URES one-shot pots in the opposite sense as to the sense required previously and registered in step 4.
Check the time spread of each URES output signal (PWB pin 1) to be :

⩽ 14 μs	18.75"/sec MTH
⩽ 7 μs	37.5" /sec MTH
⩽ 3.5 μs	75" /sec MTH

Should any of the one-shots not meet the requirement, proceed as follows :

a - Set the one-shots to their minimum delay once more, as described in step 4.

b - Check that the selected sync track is, in effect, the one having the greatest delay.

If, even after these checks, the one-shot time spreads still do not correspond, it is advisable to leave the involved sync track mis-aligned but have the one-shot time spread within the limits.

8) - Stop the tape with STOP and rewind with REW UNLOAD.

9) - When the tape has fully rewound switch the unit OFF and disconnect the Field-Tester cable.

5 - FINAL CHECKS

- None.

ROUTINE : 4.31

NAME : Adjustment of GUN 170 board VUSO
DURATION : 0.15 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Multimeter
- Screwdriver P.N. 7131248 J
- Bridging link

2 - PURPOSE

- To adhere to the SOGU board product functional specifications. The adjustment is only to be carried out when board VUSO is repaired.

Note

If a VUSO board is to be replaced, this routine is to be carried out as a mere check routine, because the new boards are already fully calibrated.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Preset the VUSO board input to logic level "0" by grounding G-22-06.

2) - Connect positive meter lead to G - 22 - 16 and negative lead to ground.
Trim pot on board VUSO (G - 22) and bring the output level SOFA to $\boxed{+7.8 \text{ to } +8 \text{ V}}$.

3) - Remove ground from G - 22 - 06. Load VUSO input to logic level "1" by grounding S - 22 - 16.

4) - Check output level to be $\boxed{+6.8 \text{ to } 7 \text{ V}}$.

5) - Remove grounding from S - 22 - 16 and disconnect the multimeter.

5 - FINAL CHECKS

- None.

ROUTINE : 4.32

NAME : Adjustment of GUN 171 board TESO
DURATION : 0.15 hr
PREREQUISITES : None

NRZ 7 Voie

1 – TOOLS AND INSTRUMENTS

- Multimeter
- Screwdriver P.N. 7131248 J
- Bridging link

– PURPOSE

- To adhere to the DOSO board product functional specifications. The adjustment is only to be carried out when board TESO is repaired.

> **Note**
>
> If a TESO is replaced, the routine is to be carried out as a mere check routine, as the new boards are already fully calibrated.

3 – PRELIMINARY CHECKS

- None.

4 – PROCEDURE

1) – Preset the TESO board input to logic level "0" by grounding D-25 – 02.

2) – Connect positive meter lead to D – 25 – 14 and negative lead to ground.
Trim the upper pot on board TESO (D – 25) to bring the output level SOAL to +2.8 to 3 V.

3) – Now connect the pos. meter lead to D – 25 – 15 and trim the lower TESO pot. to bring the output level SOBA to + 1.8 to 2 V.

4) – Remove ground from D – 25 – 02 and preset the TESO input to logic level "1" by grounding S – 22 – 15.

5) – Check output level SOBA to be +1.5 to 1.7 V.

6) – Remove grounding from S – 22 – 15 and disconnect the multimeter.

5 – FINAL CHECKS

– None.

ROUTINE : 4.33

NAME : Adjustment of GUN 171 board ALFI

NRZ 7Voie

DURATION : 0.25 hr

PREREQUISITES : None

1 – TOOLS AND INSTRUMENTS

– Scope	P.N. Tektronix 422
– Screwdriver	" 7131248 J
– Multimeter	

2 – PURPOSE

– To realize the amplifiers functional specifications. The adjustment is to be carried out when the board is either repaired or replaced.

3 – PRELIMINARY CHECKS

– Check scope vertical amplifier calibration.

4 – PROCEDURE

1) – Connect positive meter lead to PWB ALFI pin 01 and the negative lead to pin 17. The ALFI boards are mounted on the GUN 171 as per following table.

TRACK	GUN SLOT
1	D – 07
2	D – 08
3	D – 09
4	D – 10
5	D – 11
6	D – 12
7	D – 13
8	D – 14
9	D – 15

2) – Vary the lower ALFI boards pot, setting output voltage to :

+ 1.4 to + 1.6V

3) - Disconnect the multimeter.

4) - Connect scope channel 1 to ALFI pin 01 and channel 2 to pin 16.
Sync scope on INT AUTO.

5) - Record a continous sequence of 1000 character blocks with byte 15 - 15, using the 800 bpy density.

6) - Measure the peak-to-peak input value (Channel 2) and, by trimming the upper ALFI pot, set the V - out Signal (Channel 1) to :

1,5 times V in

7) - Disconnect the scope.

5 - FINAL CHECKS

- None.

ROUTINE : 4.34

NAME : Adjustment of GUN 170 and GUN 171 boards UNIV and UNAS
DURATION : 0.25 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope	P.N. Tektronix 422
- Iron, soldering	" 7144451 X
- Screwdriver	" 7133248 J

2 - PURPOSE

- To realize the boards functional specifications. The adjustment is to be done whenever the boards are either repaired or replaced.

3 - PRELIMINARY CHECKS

- UNIV P.N. 0612130 S - UNAS P.N. 0612145 V.

4 - PROCEDURE

1) - Locate the one-shot timing list on the product documentation.

2) - Solder on the interested board the required capacitor value, which may be got from the old board.

3) - Connect one scope channel to the input of the board to be set-up.

4) - Run through a program to test item as required by the table shown on the following page.

NAME	SLOT	TEST
TERI	G-13-1	Write at 1600 bpi
TU21	G-13-10	Write at 1600 bpi
TEBA	G-14-01	Write at 1600 bpi
TUBA	G-14-10	Write at 1600 bpi
UNTI	G-04-01	Write at 1600 bpi
NOBO	C-40-01	Write at 800 bpi
NOBI	C-40-10	Write at 800 bpi

5) - Sync the scope on INT positive.

6) - Adjust the one-shot time as per One-shot Timing List by turning the pot clockwise (to increase) or anticlowise (to decrease).
Measurements are to be taken at the edges mean point, with the tolerances specified by the One-shot Timing list.
If no tolerances are given, take them as being $\boxed{\pm 5\%}$.

7) - Disconnect the scope.

5 - FINAL CHECKS

- None.

ROUTINE : 4.35

NAME : Adjustment of GUN 170 boards UNRAB and UNRAM
DURATION : 0.30 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope	P.N. Tektronix 422
- Iron, soldering	" 7144451 X

2 - PURPOSE

- To adhere to the product functional specifications. The adjustment is to be done whenever one of the said boards is either set-up or replaced.

3 - PRELIMINARY CHECKS

- UNRAB P.N. 0612135 U - UNRAM P.N. 0615362

4 - PROCEDURE

1) - Locate the one-shot timing list on the product documentation.

2) - Solder on the interested board the required capacitor value, which may be got from the old board, ensuring that the positive terminal points toward the middle of the board.

3) - Connect one scope channel and the EXT sync input to the board output and input respectively.

4) - Run through a program that utilizes the function of the board, as per table on the following page.

NAME	SLOT	SYNC	TEST
UPSEN	G-11-14	G-11-3	Write at 1600 bpi
UNOVN	G-06-14	G-06-3	Write at 1600 bpi
RESAN	G-07-14	G-07-3	Write at 1600 bpi
ENRIN	G-08-14	G-08-3	Write at 1600 bpi
URTIN	G-05-14	G-05-3	Write at 1600 bpi
UNRON	G-09-14	G-09-3	Write at 1600 bpi
UPIPN	G-10-14	G-10-3	Write at 1600 bpi
MEMAN	G-15-14	G-15-3	Count - Carry Out
BOTON	G-12-14	G-12-3	Erase-Read Rev to BOT

5) - Sync the scope on EXT negative.

6) - Adjust the one-shot time as per One-shot Timing List by decreasing the capacitor value (to decrease time) or increasing the capacitor value (to increase time).
Measurements are to be taken at the edges mean point, with the tolerances specified by the One-shot Timing List.
If no tolerances are given, take them as being $\boxed{\pm 5\ \%}$.

7) - Disconnect the scope.

5 - FINAL CHECKS

- None.

ROUTINE : 4.36

NAME : Adjustment of GUN 150 board UNIV
DURATION : 0.25 hr
PREREQUISITES : None

1 – TOOLS AND INSTRUMENTS

– Scope	P.N.	Tektronix 422
– Iron, soldering	"	7144451 X
– Screwdriver	"	7131248 J
– Work tape	"	4355483 F
– Link, bridging		

2 – PURPOSE

– To adhere to the product functional specifications. The adjustment is to be done when the board is either repaired or replaced.

3 – PRELIMINARY CHECKS

– None.

4 – PROCEDURE

1) – Locate the one-shot timing list on the product documentation.

2) – Solder on the UNIV board (P.N. 0612130 S) the required capacitor value which may be got from the old board, ensuring that the positive terminal faces toward the middle of the board.

3) – Connect a scope channel on the output of the board to be set-up.

4) – To set up one-shot RILO (B-9-10) follow this procedure:
  a) – switch the unit ON and load the work tape. Preset signal LODAN to logic level "0" by grounding A – 29 – 10,
  b) – proceed to step 6.

5) – To set up other one-shots, proceed as follows :
  a) – switch the unit ON and load the work tape. Set the ON/OFF LINE switch to ON and press LOAD,
  b) – carry out required test as per table on the following page :

NAME	SLOT	TEST
BOBA	A-11-1	ERASE - REWIND
FRIA	B- 9-1	ERASE - REWIND
INTA	A-11-10	ERASE *
MECO	B-21-1	ERASE **

* or with a Field-tester Start-Stop command sequence.

** or with a Field-tester continuous mode command or by depressing LOAD beyond the BOT marker.

6) - Sync scope on INT positive.

7) - Set the one-shot time as per One-shot Timing list by trimming pot clockwise(to increase)or anticlockwise (to decrease). Measurements are to be done at the edges mean point with the tolerance stated in the One-shot Timing list.

8) - Rewind the tape with REW-UNLOAD

9) - When the tape has fully rewound, remove the tape. Switch the unit OFF, disconnect the scope and remove grounding from A - 29 - 10.

5 - FINAL CHECKS

- None.

ROUTINE : 4.37

NAME : Adjustment of GUN 150 board ULUN
DURATION : 0.25 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Scope	P.N. Tektronix 422
- Iron, soldering	" 7144451 X
- Work tape	" 4355483 F

2 - PURPOSE

- To adhere to the product functional specifications. The adjustment is to be done when the board is either repaired or replaced.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Locate the one-shot timing list on the product documentation.

2) - Solder on the ULUN board (P.N. 0617240 S) the required capacitor value,which may be got from the old board, ensuring that the positive terminal faces toward the middle of the board.

3) - Connect a scope channel to B-10-14.

4) - Switch the unit ON and mount the work tape.

5) - Sync the scope on INT negative.

6) - Press LOAD and check that the one-shot time is that specified in the One-shot Timing List.
If requirement is not satisfied decrease the capacitor value to decrease time, or increase the value to increase the time.
Measurements are to be done at the edges mean point , with the tolerances stated in the One-shot Timing List.

7) - To trigger ULUN, open the bin cover, close it again and press LOAD.

8) - Switch the unit OFF, remove the tape and disconnect the scope.

- FINAL CHECKS
  - None.

ROUTINE : 4.38

NAME : General Tape path checks
DURATION : 0.25 hr
PREREQUISITES : Routine 3.1.

1 - TOOLS AND INSTRUMENTS

- Gauge	P.N.	0837309 W
- Universal handle	"	7138485 B
- Screwdriver blade 6 x 150	"	4355315 F

2 - PURPOSE

- To check the state of wear of tape path components.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Visually check that the surface of the upper roller has no rough spots or scratches. Spin the roller and check for free rotation. If requirement is not satisfied, replace roller as per Routine 5.19.

2) - Loosen the mounting screw and remove the magnetic head cylindrical guide fixed ring.

3) - Visually check that the inner surface of the ring does not have wear patches in correspondence with the point of contact of the tape. If the condition is not satisfactory, rotate the ring 180°. This rotation can only be done once, the ring is to be changed the second time.

4) - Loosen the mounting screw and remove the slanted head guide fixed ring.

5) - Visually check that the inner surface of the ring does not have wear patches in correspondence with the point of contact of the tape. If the condition is not satisfactory, rotate the ring 180°. This rotation can only be done once, the ring is to be changed the second time.

6) - Visually check the surfaces of the tape cleaners. They must be perfectly smooth, otherwise replace them as per Routine 5.20.

7) - Spin the lower roller, its rotation must be smooth and noiseless. If it tends to stick at low rotational rates, change it.

8) - Ensure that the Scotchlite tape adheres perfectly to the vacuum bin walls, otherwise replace the wall.

9) - Carefully check the rubber capstan ring. It must not be cracked or rough. If it is, change it as per Routine 5.7.

10) - Gauge check the head to mu-shield distance and adjust as per Routine 4.11.

5 - FINAL CHECKS

- None.

ROUTINE : **4.39**

NAME : Tape movement checks
DURATION : 0.40 hr
PREREQUISITES : None

1 - TOOLS AND INSTRUMENTS

- Work tape
- Dental mirror
- Small pocket torch

2 - PURPOSE

- To check the correct tape drive along its entire path and winding of tape on both machine and file reels.

3 - PRELIMINARY CHECKS

- None.

4 - PROCEDURE

1) - Switch the unit ON, load the work tape and depress LOAD.

2) - Open the upper bin cover and, manually rotating the capstan counterclockwise, move the BOT from under the photosensing. Simulate the closed bin cover condition, by manually activating the bin cover switch, press LOAD and let the tape unwind.

3) - Refer to fig. 4.22. Place the dental mirror as illustrated in detail D and check that the tape does not rub against the reel flanges. Should this requirement not be met, implement routine 4.1.

4) - Depress REWIND. Place the dental mirror as shown in fig. 4.22 detail C and check that the tape does not rub against the file reel flanges otherwise, carry out routine 4.2.

5) - Command forward tape drive and, holding the small pocket torch as shown in detail Z and with the angled mirror in positions A and B, verify that the tape does not countinously interfere with the glass.
Should, on the other hand, this requirement not be met, the roller will have acquired an excessive radial play therefore, proceed to replace it according to routine 5.20.

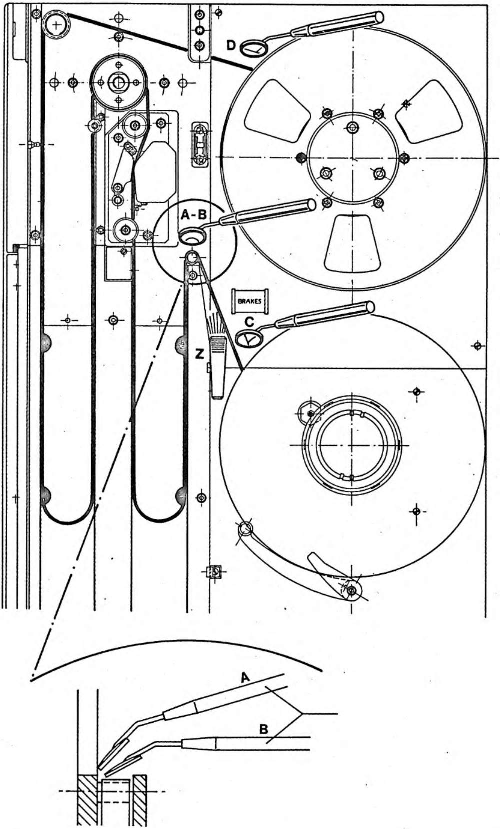


Fig. 4.22 - Tape drive check.

6) - Check that the internal upper bin cover surface presents no scratches in correspondence with the upper roller (refer to fig. 4.23) otherwise, replace the old type roller with the new one P/N 0687244 F (routine 5.19). Figure 4.24 illustrates the difference between the two rollers.

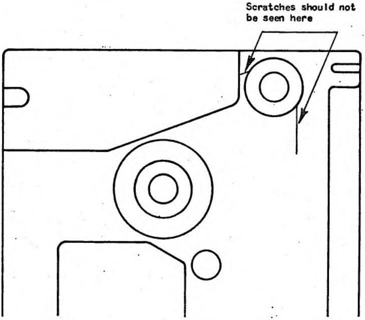


Fig. 4.23 - Internal upper bin cover surface

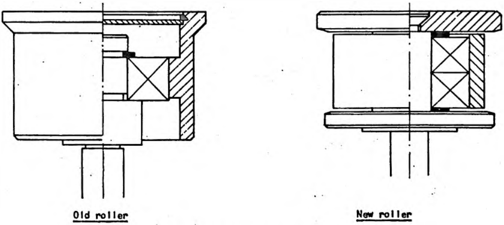


Fig. 4.24 - Upper tape roller

7) - Remove the work tape and switch the unit OFF.

5 - FINAL CHECKS

- None

ROUTINE :4.40

NAME : Lower tape roller orthogonality check
DURATION : 0,30 hr.
PREREQUISITES : No tape loaded

1 - TOOLS AND INSTRUMENTS

- Special gauge plate	P/N 4355668
- Small pocket torch	

2 - PURPOSE

- Ascertain the correct orthogonality of the roller.

3 - PRELIMINARY CHECKS

- Implement routine 4.39.

4 - PROCEDURE

1) - Open both the top and botton bin covers.

2) - Switch the unit ON to throw light over the working area.

3) - Position the gauge plate with its 89° 56' face as illustrated in figure 4.25.

4) - Turn on the pocket torch and, positioning it as shown in fig. 4.25, verify presence of the light beam on side A.

5) - Place the gauge with its 90° 4' face as given in fig. 4.26.

6) - Again switch on the torch and verify the light beam on side B.

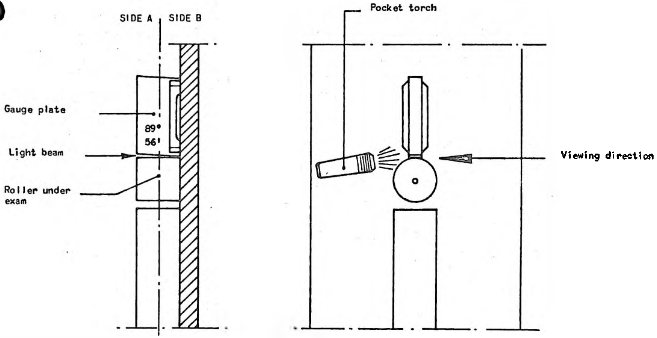


Fig. 4.25 - Light beam check on SIDE A

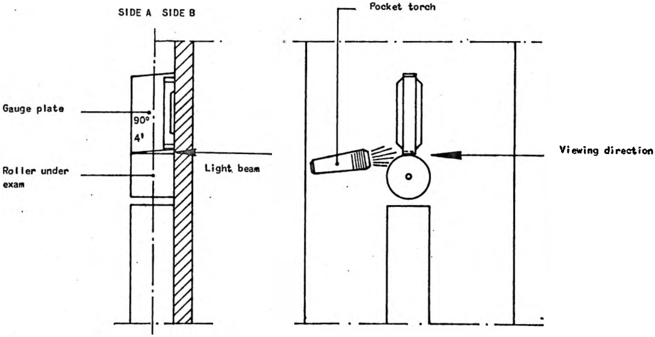


Fig. 4.26 - Light beam check on SIDE B

7) - When light beams are evidenced on both side A and B it can be presumed that the roller is mounted with orthogonality limits within 90° ± 4'.

8) - Should the light beams result inverted or be present on one side only, even when placing the gauge plate on both faces, appropriately rotate the roller to correct its position therefore satisfy the requirement.

5 - FINAL CHECKS

- Implement routine 4.39.

5. REMOVALS AND REPLACEMENTS

ROUTINE : 5.1

NAME : File reel hub removal
DURATION : 0.30 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen key P.N. 435564/ Y

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.

2) - Adjust the 4 handler feet to lift the unit from the floor.

3) - Draw the unit out of its physical lay-out configuration position.

4) - Loosen the hub fixing set screws.

5) - Remove the hub

3.2. - Replacement

1) - Carry out the operations described in steps 5 and 4 above in the reverse order.

Caution

When inserting the key in the motor shaft keyway, pay attention not to contact the motor flange.

2) - Carry out Routine 4.2.

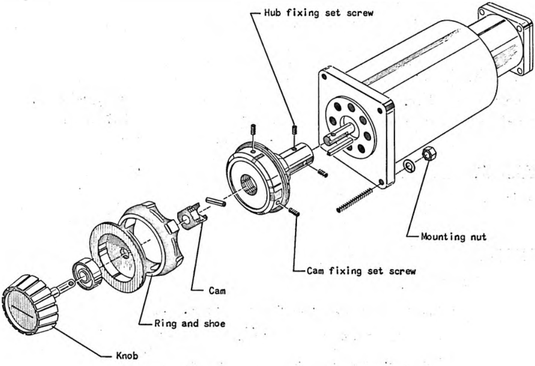


Fig. 5.1. – File reel hub removal

4 – FINAL CHECKS

– None.

ROUTINE : 5.2

NAME : Ring and shoe removal
DURATION : 0.10 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Key, Allen 2 mm	P.N.	7133128 X
- Ring and shoe assembly	"	0672387 K

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Loosen the hub cam fixing set screws.

2) - Turn the knob anticlockwise and remove.

3) - Withdraw the ring and shoe assembly.

3.2. - Replacement

1) - Carry out the removal operations, described above, in the reverse order.

2) - Carry out Routine 4.3.

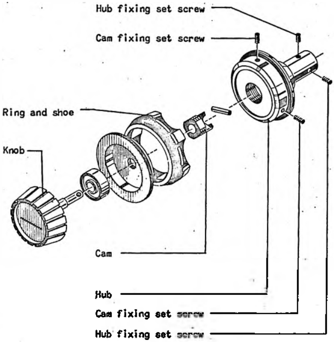


Fig. 5.2. - Ring and shoe removal

4 - FINAL CHECKS

- None.

ROUTINE : 5.3

NAME : Machine reel hub removal
DURATION : 0.30 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Allen key	P.N. 4355647 Y
– Allen key 4 mm	

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Remove the front and rear joining brakets, holding the intermediate handlers together, and only the side panel from the last unit.

2) – Adjust the 4 handler feet to lift the unit from the floor.

3) – Draw the unit out of its physical lay-out configuration position.

4) – Remove the 3 set screws fixing the machine reel hub cover. Remove the cover.

5) – Remove the machine reel.

6) – Loosen the set screws fixing the hub and withdraw the hub.

3.2. – Replacement

1) – Carry out operations described at steps 6, 5 and 4 above in the reverse order

> Caution
>
> When inserting the key in the motor shaft keyway, pay attention not to contact the motor flange.

2) – Carry out Routine 4.1.

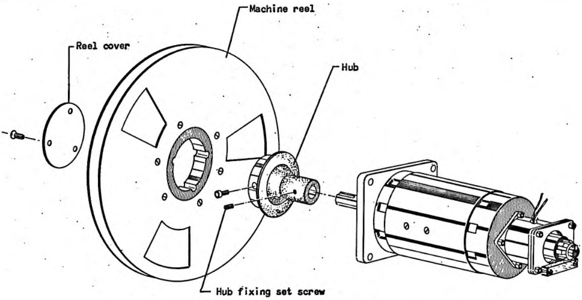


Fig. 5.3. - Machine reel hub removal

4 - FINAL CHECKS

- None.

ROUTINE : 5.4

NAME : Machine reel motor removal
DURATION : 0.45 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen key	P.N. 4355647 Y
- Screwdriver 6mm blade	
- Allen key 4 mm	
- Hex box wrench - 14 mm	

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.

2) - Adjust the 4 handler feet to lift the unit from the floor.

3) - Draw the unit out of its physical lay-out configuration position.

4) - Disconnect leads from terminal strip P4.

5) - Carry out Routine 5.3 to remove machine reel hub.

6) - Remove reel motor mounting nuts.

7) - Remove the motor.

3.2. - Replacement

1) - Carefully clean motor mounting plate to casting mating surface.

2) - Carry out operations of steps 7 through 4, described above, in the reverse order.

3) - Carry out Routine 4.1.

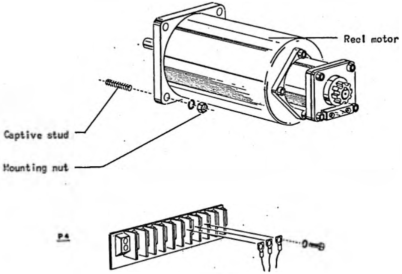


Fig. 5.4. – Machine reel motor removal

4 – FINAL CHECKS

- None.

ROUTINE : 5.5

NAME : File reel motor removal
DURATION : 0.50 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Allen key	P.N. 4355647 Y
– Screwdriver 6 mm blade	
– Hex box wrench– 14 mm	

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.

2) – Adjust the 4 handler feet to lift the unit from the floor.

3) – Draw the unit out of its physical lay-out configuration position.

4) – Disconnect leads from terminal strip P6.

5) – Carry out Routine 5.1. to remove file reel hub.

6) – Remove file reel motor mounting nuts.

7) – Remove the motor.

3.2. – Replacement

1) – Carefully clean motor mounting plate to casting mating surface.

2) – Carry out operations of steps 7 through 4, described above, in the reverse order.

3) – Carry out Routine 4.2.

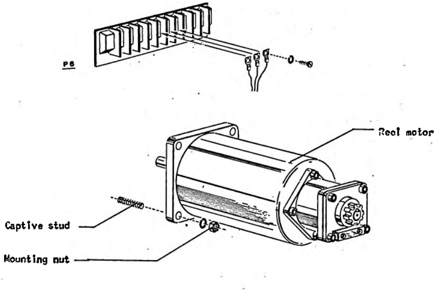


Fig. 5.5. - File reel motor removal

4 - FINAL CHECKS

- None.

ROUTINE : **5.6**

NAME : Reel motor brakes removal
DURATION : 0.40 hr
PREREQUISITES : -

1 - TOOLS AND INSTRUMENTS

- Screwdriver 6mm blade
- Allen key 2 mm
- Allen key 3 mm
- Allen key 3.5 mm
- Vernier gauge

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Units fitted with HISI brakes P/N 0687020 L

3.1.1. - Removal

1) - Disconnect leads from terminal board P4 (machine reel) or P6 (file reel).
2) - Slacken the splined shaft set screws.
3) - Unscrew the mounting Allen bolts and remove the brake housing.

3.1.2. - Replacement

1) - Insert the new brake and tighten it in place with the 4 fixing screws.
2) - Connect the appropriate leadwires to the terminal strip.
3) - Energize the brake by switching the unit ON and opening the upper bin cover.
4) - Place the brake lining and splined shaft in such a way as the latter jutts-out 11 mm from the lining. Refer to 5.6.a).
5) - Fit the key and tighten the splined shaft set screws.
6) - Switch the unit OFF to deenergize the brake.

3.2. - Units fitted with JAEGER brakes P/N 0687043 X

3.2.1. - Removal

1) - Unsolder the electrical supply leads from the involved reel brake.

2) - Loosen the 3 set screws.

3) - Remove the 4 screws holding the brake to the motor.

3.2.2 - Replacement

1) - Remove the screws and units holding the PIF PWB bracket to the brake (these screws and nuts are only fitted for warehouse reasons).

2) - Insert the new brake and tighten the 4 fixing screws.

3) - Appropriately insert the shaft key and fully tighten the 3 set screws.

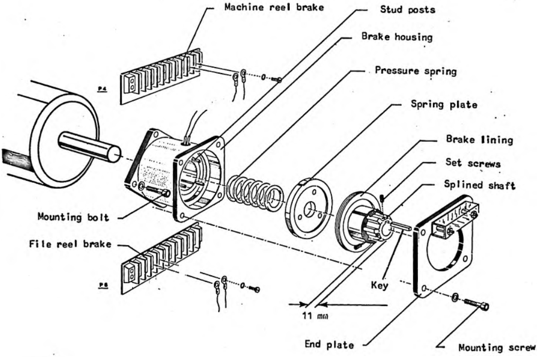


Fig. 5.6 a) HISI Brake (P/N 0687020L)

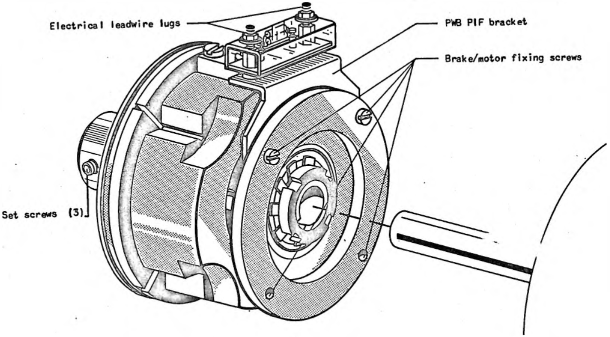


Fig. 5.6 - b) JAEGER Brake (P/N 0687043 X)

4 - FINAL CHECKS

- None.

ROUTINE : 5.7

NAME : Capstan motor removal
DURATION : 0.20 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Peg wrench	P.N. 0837504 D
- Extractor	" 0842725 X
- Open end wrench - 17 mm	

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Immobilize the capstan with the peg spanner. Loosen the split collar lock-nut with the 17 mm spanner.

2) - Mount the extractor on the capstan, turn the knurled collar clockwise to free the capstan from the split collar.

3) - Remove the capstan.

3.2. - Replacement

1) Fit the capstan and split collar on the motor shaft.

2) - Hand tighten the lock-nut to make the split collar bind onto the capstan. Ensure that the group can move on the motor shaft.

3) - Carry out Routine 4.6. Procedure steps 4 and 5.

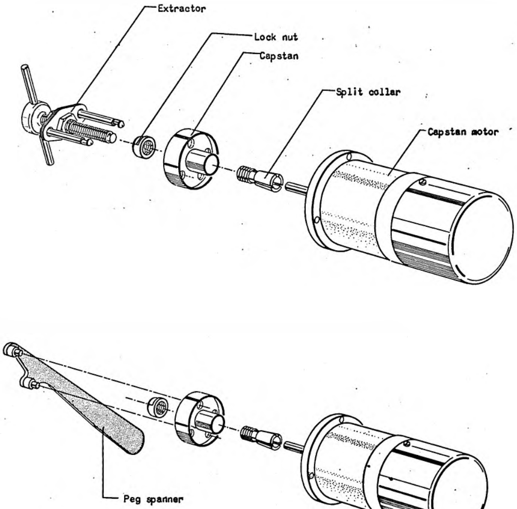


Fig. 5.7. – Capstan motor removal

4 – FINAL CHECKS

– None.

ROUTINE : 5.8

NAME : Tachometer lamp replacement
DURATION : 0.35 hr
PREREQUISITES : Unit OFF, no tape loaded, burnt tachometer lamp

1 – TOOLS AND INSTRUMENTS

– Universal handle	P.N.	7138485 B
– Screwdriver blade 5 x 150	"	4355314 B
– Screwdriver	"	7131248 J
– Iron, soldering	"	7144451 X
– Key, Allen 1.5 mm	"	0494140 Y
– Tachometer lamp	"	0001950 W

– PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Remove the screws fixing the motor cover dome and remove the dome.

2) – Remove the lamp holding plate screws.

3) – Take the lamp out of the sector group.

4) – Withdraw the lamp from its rubber sheath and unsolder the terminals.

3.2. – Replacement

1) – Solder-in the new lamp.

2) – Replace the rubber sheath onto the lamp.

3) – Fit the lamp in the sector group.

4) – Carry out Routine 4.7.

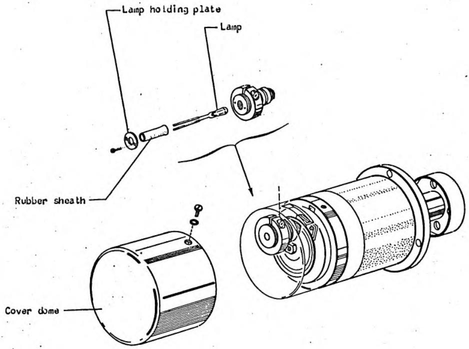


Fig. 5.8. – Tachometer lamp replacement

4 – FINAL CHECKS

- None.

ROUTINE : 5.9

NAME : Capstan motor replacement
DURATION : 1.0 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Screwdriver 6 mm blade	
– Allen key 3 mm	
– GE Capstan motor for 18.75"/sec. and 37.5"/sec. MTH	P.N. 0687325 B
– CEM Capstan motor for 18.75"/sec. and 37.5"/sec.MTH	" 5523237 B
– GE Capstan motor for 75"/sec. MTH	" 0687455 Q

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Remove the front and rear joining brackets, holding the intermediate handlers together, and only the side panel from the last unit.

2) – Adjust the 4 stand-offs to lift the unit from the floor.

3) – Draw the unit out of its physical lay-out configuration position.

4) – Disconnect leads from terminal strip P3 on capstan motor.

5) – Unscrew the capstan motor mounting screws, accessible from the front casting. Carefully extract the motor without imparting stress on its shaft.

3.2. – Replacement

1) – Carefully clean motor mounting plate to casting mating surface.

2) – Carry out removal operations,described above, in the reverse order.

3) – Carry out Routine 4.20.

4 - FINAL CHECKS

N.B. When having to replace motor P/N 0687325 B with motor P/N 5523237B, on 18.75 and 37.5"/sec. MTHs, remember to also replace PWB POCA P/N 0614314 K - 0614315 P or 0614316 T with one either having P/N 0614319Q or 0614320 N, depending upon the machine speed.
On 75"/sec. MTHs leave the original POCA PWB P/N 0614318 L inserted.

ROUTINE : 5.10

NAME : Magnetic head removal
DURATION : 0.15 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Spanner, open ended 12 mm	P.N.	0064072 H
- Key, ALlen 3 mm	"	7133130 Y

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Unscrew the nut holding the suction manifold to the head. It is accesible from the rear of the casting.

2) - Withdraw the Winchester connectors.

3) - Unscrew the mounting screws and remove the head.

3.2. - Replacement

1) - Carry out operations described above in the reverse order. Before fitment,clean all mating surfaces and all parts that contact the tape.

2) - If the read/write head has been replaced, carry out Routines
- 4.23. and 4.24. for PM 9 track handlers,
- 4.25., 4.26. and 4.27. for PM + NRZI 9 track handlers,
- 4.28., 4.29. and 4.30. for NRZI 7 track handlers.

4 - FINAL CHECKS

- None.

ROUTINE : 5.11

NAME : Vacuum motor removal
DURATION : 0.40 hr
PREREQUISITES : Unit OFF

1 – TOOLS AND INSTRUMENTS

– Vacuum motor	P.N. 0687048 M
– Vacuum motor	" 0672436 L
– Vacuum motor	" 5540440 X
– Screwdriver, 6 mm blade	
– Allen key, 4 mm	
– Allen key, 3 mm	

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal of motor P.N. 0687048 M

1) – Disconnect leads from terminal strip P6.

2) – Unscrew the 3 mounting screws and remove the motor.

3) – Unscrew the thumb nuts and withdraw the vacuum motor cover.

4) – Remove the grommet.

5) – Unscrew the 6 bracket holding screws and remove the group.

3.2. – Replacement

1) – Carry out operations described above in the reverse order.

2) – Carry out Routine 2.1.

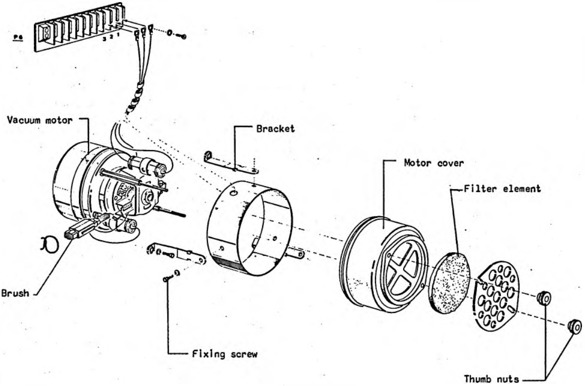


Fig. 5.9. - Removal of vacuum motor P.N. 0687048 M

3.3. - Removal of motor P.N. 0672436 L

1) - Disconnect leads from terminal strip P6.
2) - Loosen the 3 motor fixing screws and hence remove the motor.
3) - Extract the filter.
4) - Loosen the support bracket fixing screws.
5) - Remove the rubber grommet.
6) - Extract the motor.

3.4. - Replacement

1) - Carry out the above described removal sequence in the reverse order.
2) - Implement Routine 2.1.

3.5. - Removal of motor P.N. 5540440 X

1) - Remove the front and rear joining brackets, holding the intermediate handlers together, and only the right side panel from the last unit.
Adjust the 4 handler stand-offs to lift the pertinent unit from the floor and therefore draw the involved unit out of its physical configuration layout position.

2) - Remove motor cover and disconnect leads from the terminal strip.

3) - Remove the intake and exhaust flanges fixing screws.

4) - Remove the motor to cabinet structure fixing screws.

5) - Extract the motor.

3.6. - Replacement

1) - Carry out the described removal sequence in the reverse order.

2) - Implement routine 2.1, setting the vacuum level to 700 mm H20 by rotating the appropriate adjust clamp on the intake pipe fitting.

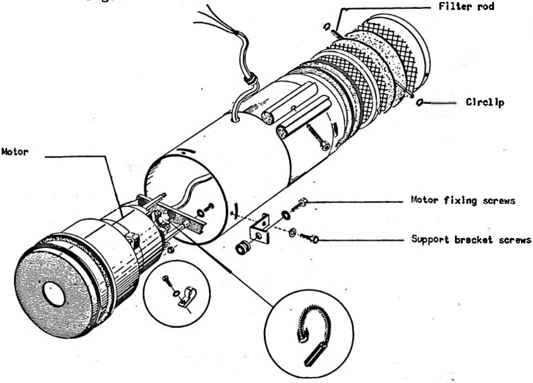


Fig. 5.10. - Removal of vacuum motor P.N. O672436 L

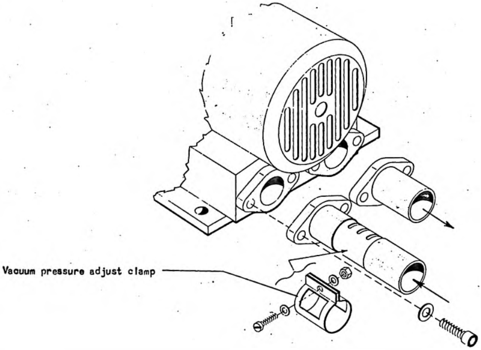


Fig. 5.10.a) - Removal of vacuum motor P.N. 5540440 X

4 - FINAL CHECKS

- None.

ROUTINE : 5.12

NAME : Write inhibit group removal
DURATION : 0.25 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Universal handle	P.N.	7138485 B
- Screwdriver, blade 5 x 150	"	4355314 B
- Key, Allen 3 mm	"	7133130 Y

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Disconnect leads from terminal strip P5.

2) - Unscrew the Allen bolts.

3) - Withdraw the write inhibit group.

3.2. - Replacement

1) - Carry out operations described above in the reverse order.

> **Note**
> Insert the armature lever into the inhibit group plunger groove.

2) - Carry out Routine 4.5.

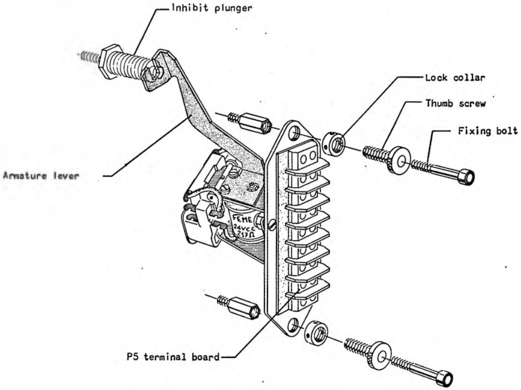


Fig. 5.11. – Write inhibit group removal

4 – FINAL CHECKS

– None.

ROUTINE : 5.13

NAME : Packing arm removal
DURATION : 0.15 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Key, Allen 2 mm	P.N. 7133128 Y
- Spring hook	" 7135440 Y

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Unhook the packing arm tensioning spring.

2) - Loosen the travel limiting plate fixing set screws.

3) - Remove the packing arm and the travel limiting plate.

3.2. - Replacement

1) - Carry out operations described above in the reverse order.

2) - Carry out Routine 4.4.

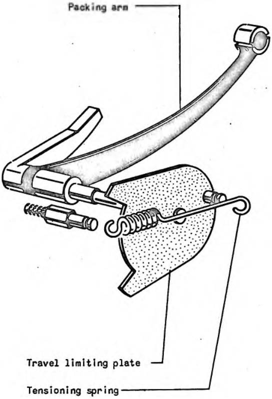


Fig. 5.12. – Packing arm removal

4 – FINAL CHECKS

- None.

ROUTINE : 5. 14
NAME : Left hand photoresistors removal
DURATION : 0.25 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Screwdriver 6mm blade
- Allen key 3 mm

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Remove electrical connections of the left hand photoresistors from terminal strip P14.

2) - Remove the fixing screws holding the left hand vacuum bin wall. Remove the wall.

3) - Remove the fixing screw holding the photoresistor group and withdraw the group.

3.2. - Replacement

1) - Carry out operations described above in the reverse order.

Note

The photoresistor group must be fitted butted up against the light tube.

2) - Carry out Routine 4.14.

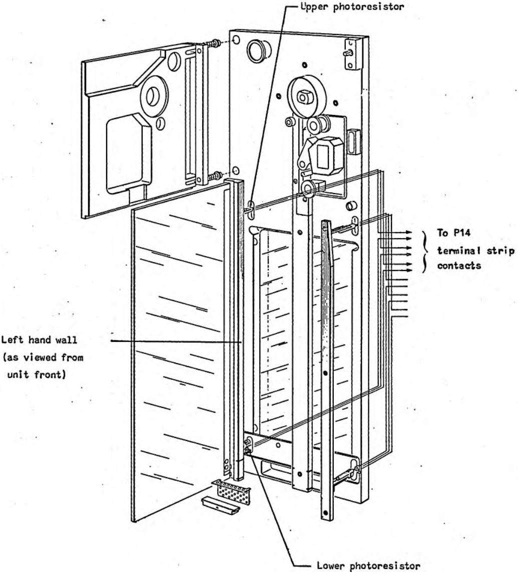


Fig. 5.13. - Left hand photoresistors removal

4 - FINAL CHECKS

- None.

ROUTINE : **5.15**
NAME : Right hand photoresistors removal
DURATION : 0.25 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

- Screwdriver 6mm blade
- Allen key, 3 mm

2 – PRELIMINARY CHECKS

- None.

3 – PROCEDURE

3.1. – Removal

1) – Remove electrical connections of the right hand photoresistors from terminal strip P14.

2) – Remove the fixing screws holding the right hand side vacuum bin wall. Remove the wall, feeding the leads through the holes in the wall itself.

3) – Remove the fixing screw holding the photoresistor group and withdraw the group.

3.2. – Replacement

1) – Carry out operations described above in the reverse order.

Note

The photoresistor group must be fitted butted up against the light tube.

2) – Carry out Routine 4.14.

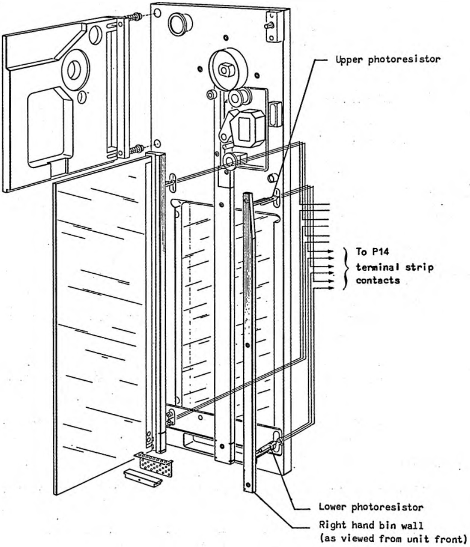


Fig. 5.14. - Right hand photoresistors removal.

4 - FINAL CHECKS

- None.

ROUTINE : 5.16

NAME : Photosensor lamp replacement
DURATION : 0.25 hr
PREREQUISITES : Burned-out lamp

1 – TOOLS AND INSTRUMENTS

– Universal handle	P.N.	7138485 B
– Screwdriver blade 5 x 150	"	4355314 B
– Key, Allen 2.5 mm	"	7133129 S
– Screwdriver	"	7131248 J
– Iron, soldering	"	7144451 X
– Photosensor lamp	"	0672352 B

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Disconnect the photosensor leads from terminal strip P2.

2) – Remove the photosensor group by unscrewing its fixing screw.

3) – Loosen the lamp fixing screw and remove the lamp.

4) – Unsolder the lamp terminal from the numbered board.

3.2. – Replacement

1) – Fit the lamp group in the photosensor head. Cause it to butt up against the bottom of its seat and align the screwdriver slot with the longest side of the photosensor.

2) – Tighten the lamp group mounting screw.

3) – Solder terminals to points 1 and 2 of the numbered board.

4) – Replace the photosensor group.

5) – Restore electrical connections to terminal strip P2.

4 – FINAL CHECKS

– None.

ROUTINE : **5.17**

NAME : Photosensor diode replacement
DURATION : 0.25 hr
PREREQUISITES : Unit OFF, no tape loaded

1 – TOOLS AND INSTRUMENTS

– Universal handle	P.N.	7138485 B
– Screwdriver, blade 5 x 150	"	4355314 B
– Key, Allen 2.5 mm	"	7133129 S
– Screwdriver	"	7131248 J
– Iron, soldering	"	7144451 X
– Photodiode	"	0687243 J

2 – PRELIMINARY CHECKS

– None.

3 – PROCEDURE

3.1. – Removal

1) – Disconnect photosensor leads from terminal strip P2.

2) – Remove the photosensor group by unscrewing its fixing screw.

3) – Remove the fixing screw from the transparent plate and withdraw the faulty photodiode.

3.2. – Replacement

1) – Fit the rubber sheath on the photodiode. Thread the red sleeving on anode lead, identified by the red dot. Thread the yellow sleeving on the other lead. Insert the assembly in its pertinent housing.

2) – Turn red spot outwards and parallel to the photosensor head.

3) – Replace and secure the transparent plate.

4) – Solder the photodiode terminals as per drawing n° 22943742.

5) – Replace the photosensor group and restore connections to P2.

4 – FINAL CHEKCS

– None.

ROUTINE : 5.18

NAME : Fluorescent lamp replacement
DURATION : 0.35 hr
PREREQUISITES : Replacement is mandatory under life expired conditions when reel motors do not respond to adjustment.

1 - TOOLS AND INSTRUMENTS

- Multimeter	P.N.	5282624 A
- Fluorescent lamp	"	5572652 F

2 - PRELIMINARY CHECKS

1) - Switch the unit ON.

2) - Allow about 15 minutes for the lamp to reach normal running conditions

3) - Set the meter to the 30 VDC scale. Put negative lead on pin 5, of board B - 24 (SELA) and positive lead on pin 17.

4) - Check meter reading and replace the lamp if reading results :

$$\boxed{\geqslant 18\ \text{V}}$$

3 - PROCEDURE

3.1. - Removal

1) - Switch the unit OFF.

2) - Loosen the knurled screw fixing the lamp socket.

3) - Turn the lamp 90° and extract it from its holder.

3.2. - Replacement

1) - Fit new lamp in holder by rotating it till it locks in.

2) - Secure the lamp socket with the knurled screw.

3) - Carry out Routine 4.13. and 4.14.

4 - FINAL CHECKS

- None.

ROUTINE : 5. 19

NAME : Upper roller removal
DURATION : 0.20 hr.
PREREQUISITES : Unit Off and no tape loaded

1 - TOOLS AND INSTRUMENTS

- Screwdriver 6mm blade
- Open end wrench - 10 mm

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Loosen the roller lock-nut. Access to it is from the rear of the casting. Remove the roller group.

3.2. - Replacement

1) - Carry out operations described above in the reverse order after having thoroughly cleaned all mating surfaces.

4 - FINAL CHECKS

- Carry out routine 4.39.

ROUTINE : 5.20

NAME : Lower roller removal
DURATION : 0.2 hr
PREREQUISITES : Unit off and no tape loaded

1 - TOOLS AND INSTRUMENTS

- Ring wrench - 10 mm
- Screwdriver

2 - PRELIMINARY CHECKS

- Carry out routine 4.40.

3 - PROCEDURE

1) - Loosen the roller lock-nut (access is gained from behind the unit) and remove the roller group.

2) - Thoroughly clean all the mating surfaces and replace by following the operations of step 1 above, in the reverse order.

4 - FINAL CHECKS

- Implement routine 4.40 and 4.39 in the given order.

ROUTINE : 5. 21

NAME : Tape cleaner replacement
DURATION : 0.4 hr
PREREQUISITES : Unit OFF, no tape loaded

1 - TOOLS AND INSTRUMENTS

- Allen key 2,5 mm
- Open end wrench - 12 mm
- Tape cleaner group

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

3.1. - Removal

1) - Remove the Allen screws fixing the protective head cover. These are accessible from the casting rear.

2) - Disconnect the plastic suction tube from the casting rear.

3) - Remove the Allen screws fixing the tape cleaner to the head. Withdraw the tape cleaner.

3.2. - Replacement

1) - Carry out, in reverse order, the operations described above.

2) - Carry out Routine 4.12.

4 - FINAL CHECKS

- None.

ROUTINE : **5. 22**

NAME : Vacuum motor brushes replacement
DURATION : 0.20 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- Brushes for motor P/N 0687048 M	See catalog
- Brushes for motor P/N 0672436 L	" "

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

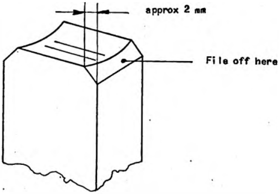
1) - Open the rear unit door.

2) - For motor P.N. 0687048 M; loosen the 2 knurled nuts and, removing the motor cover, gain access to the brushes.

For motor P.N. 0672436 L; loosen the clamping strap fixing screw and, appropriately shifting the strap, gain access to the brushes.

3) - Replace the brushes and, using a flat file, bevel off the edges (on the smallest sides) as illustrated below.

4) - Repeat removal steps 2 and 1, carrying out the described operations in the reverse order.



4 - FINAL CHECKS

- Implement Routine 2.1.

ROUTINE : 5.23

NAME : Vacuum motor filter replacement
DURATION : 0.10 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- Filter for motor P/N	0687048 M	See catalog
- Filter for motor P/N	0672436 L	" "

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

1) - Open the rear unit door.

2) - For motor P.N. 0687048 M; loosen the 2 knurled nuts and, appropriately moving and then rotating the perforated section plate within its lots, gain access to the filter.

For motor P.N. 0672436 L; exert pressureon the filter group and, imparting a clockwise rotation, pull il clear from its housing. Hence disassemble the group by removing a circlip and extracting the rod.Ref. to fig. 5.10.

3) - Replace the filter.

4) - Repeat removal steps 2 and 1, carrying out the described operations in the reverse order.

4 - FINAL CHECKS

- None.

ROUTINE : 5.24

NAME : Operator panel lamp replacements
DURATION : 0.10 hr
PREREQUISITES : Unit OFF

1 - TOOLS AND INSTRUMENTS

- Lamp tweezers (extractor)	P.N.	5570510 Z
- Lamps	"	0001823 D

2 - PRELIMINARY CHECKS

- None.

3 - PROCEDURE

1) - Grasp the pertinent plastic indicator cover and extract it.

2) - With the aid of the lamp tweezers, extract the faulty lamp and insert the new one.

3) - Replace the plastic indicator cover.

4 - FINAL CHECKS

- Verify the replaced lamp efficiency by ascertaining that it lights upon occurrence of its pertinent function status.

2

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MAGNETIC TAPE HANDLERS

MTH 101 to 117 – 163 to 172

Troubleshooting Aids

AI Field Engineering
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FOREWORD

This manual aims to guide the engineer to principally isolate faulty components and faults that could be verified on cables or printed circuits.

In case symptoms result doubtfull, the procedure is to be carried out right from the beginning.
Only when the symptoms direct the research, with certainty, toward a determined circuit is it advisable to pass directly to the paragraph dealing with the involved circuitry.

Should the procedure enable the engineer to isolate a particular part of a faulty circuit but analysis of the given components not give positive results, then the research is to be directed toward machine parts which are in direct connection with these components. (i.e. wiring, printed circuits, connectors, etc.).

Transistor terminology used in this manual is hereby given :

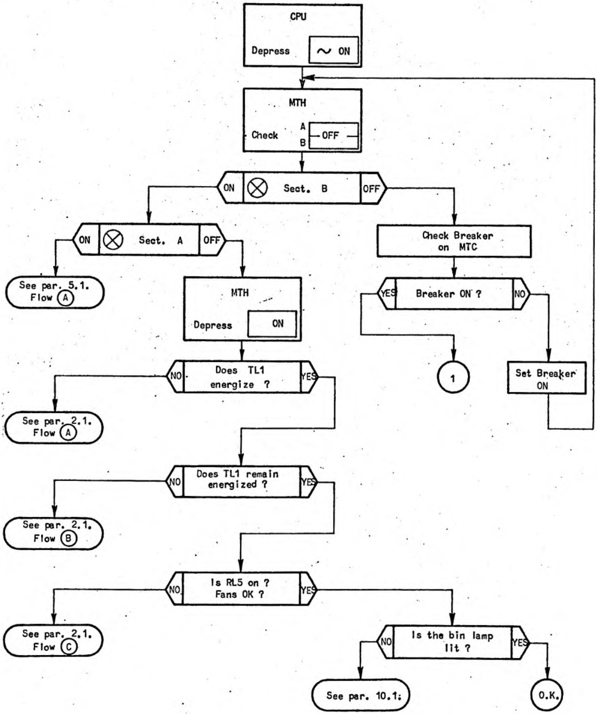
- Cut-off – Term used when there is no current flow between the emitter and collector.
- Saturation – When current flows between the emitter and collector (small p.d. measured across the terminals) when the transistor functions in the ON-OFF mode.
- Conductivity – Term used when a given current flow sussists between the emitter and collector, but not sufficient to bring it to saturation, when the transistor functions as a linear amplifier.

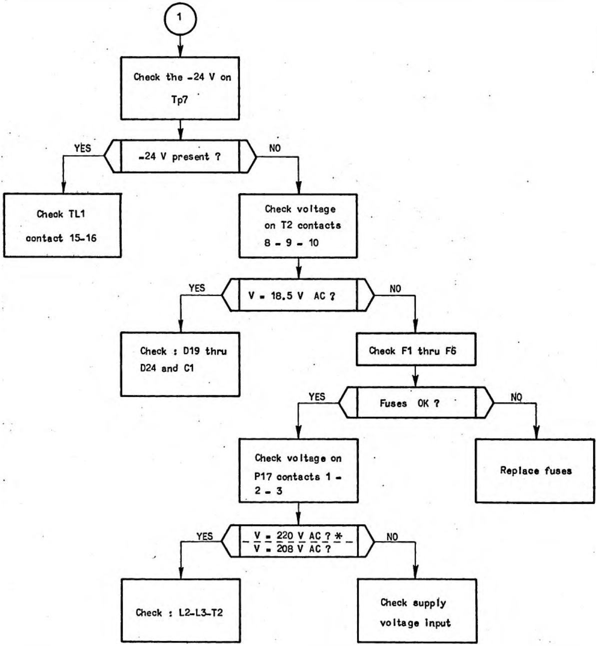
Note

Scope waveforms have been revealed on a 60 Hz unit set to 18.75"/sec.

1. -24 V POWER SUPPLY AND AC MAINS INPUT

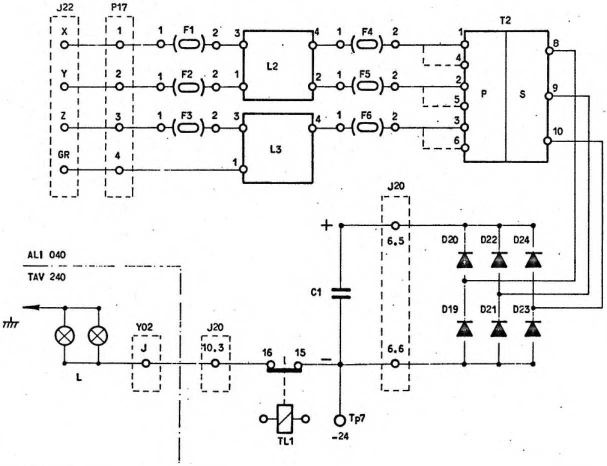
1.1. - FLOW CHART





* 220 V AC if 50 Hz
208 V AC if 60 Hz

1.2. - CIRCUIT DIAGRAM

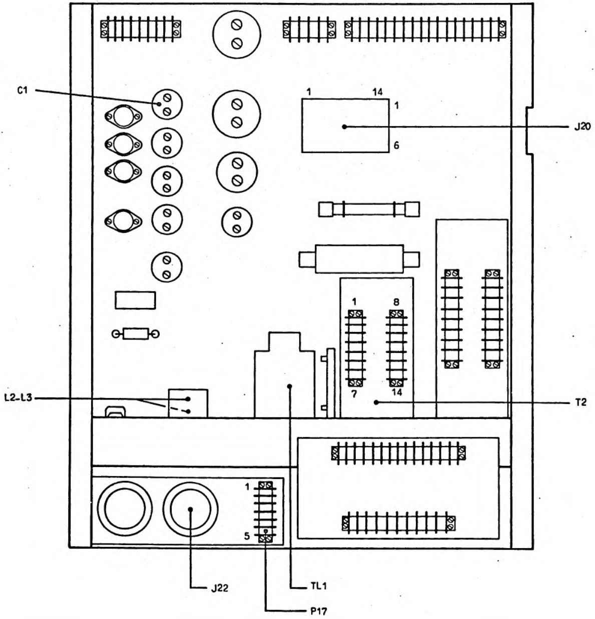


1.3. - MACHINE DOCUMENTATION REFERENCE

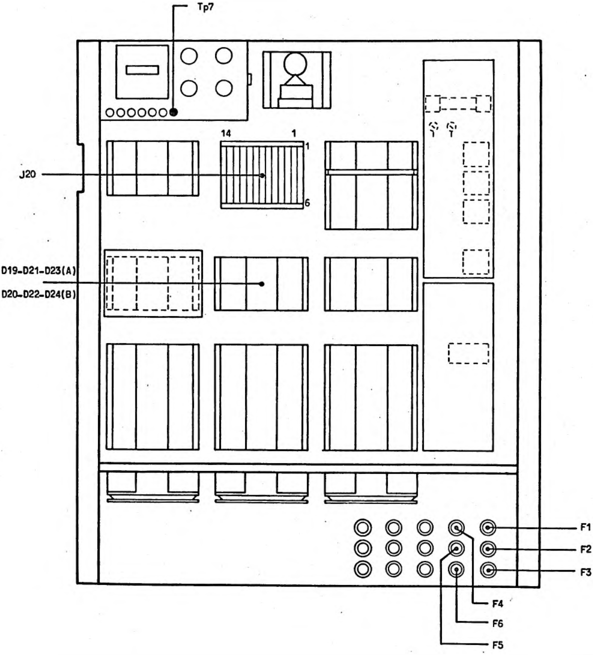
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
TAV 240	14033011

1.4. - COMPONENT LAYOUT

ALI 040 - Rear View



ALI 040 - Front View

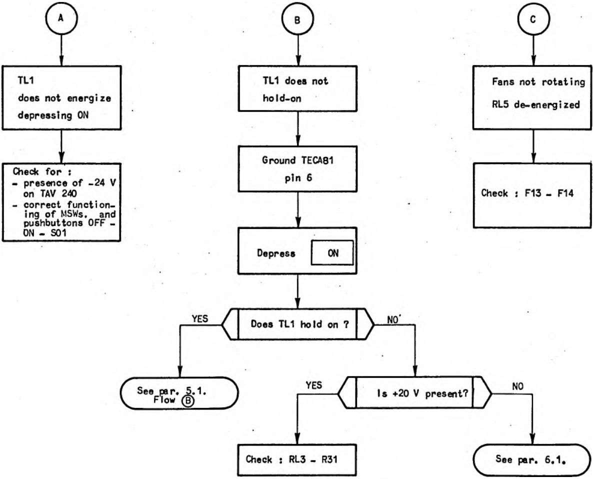


1.5. - PARTS LIST

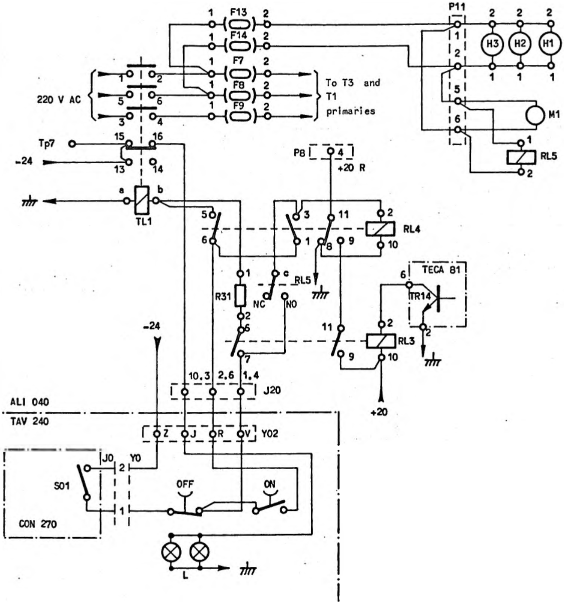
Component	Location	Logical and Electrical Functions
C1	ALI 040	-24 V Filter Capacitor
D19 thru D24	ALI 040	-24 V Bridged Diodes
F1 thru F6	ALI 040	Fuses
L	TAV 240	Lamp. Physically mounted in lower half of the OFF pushbutton. When lit, signals that the unit is switched off with presence of AC input voltages.
L2 - L3	ALI 040	Input Voltage Filters
T2	ALI 040	Transformer
Tp7	ALI 040	Test point (-24 V)
TL1	ALI 040	Main breaker

2. HANDLER SWITCH-ON AND AC DISTRIBUTION CIRCUIT

2.1. - FLOW CHART



2.2. - CIRCUIT DIAGRAM

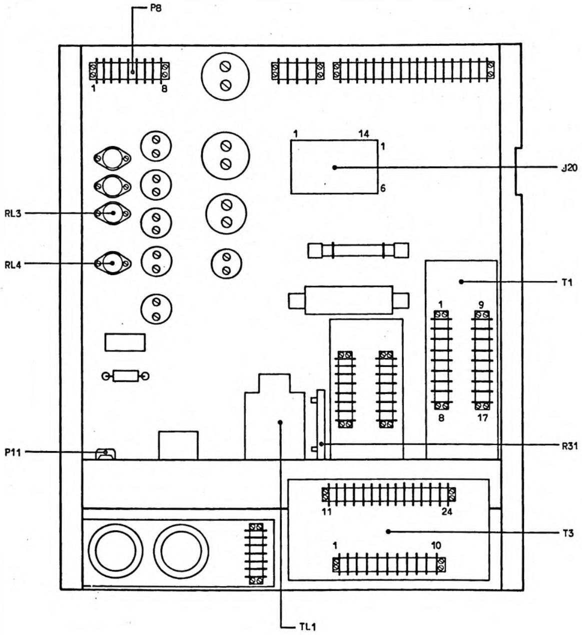


2.3. - MACHINE DOCUMENTATION REFERENCE

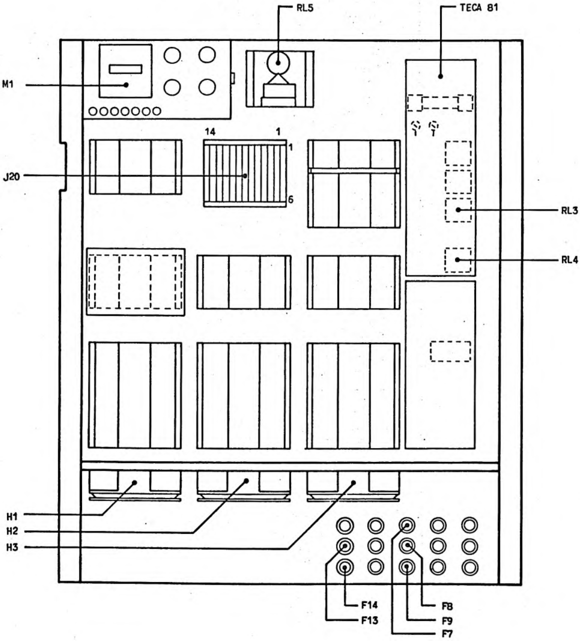
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219 - 2220)
TAV 240	14033011

2.4. - COMPONENT LAYOUT

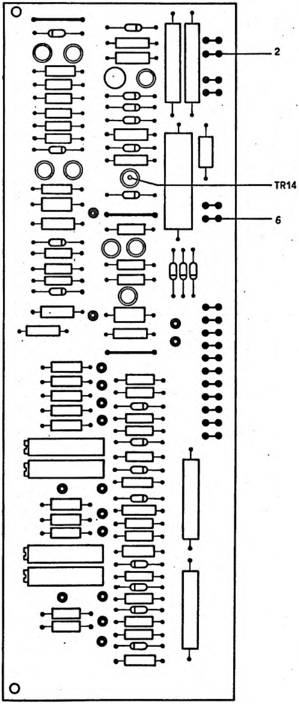
ALI 040 - Rear View



ALI 040 - Front View



ALI 040 - PWB TECA 81

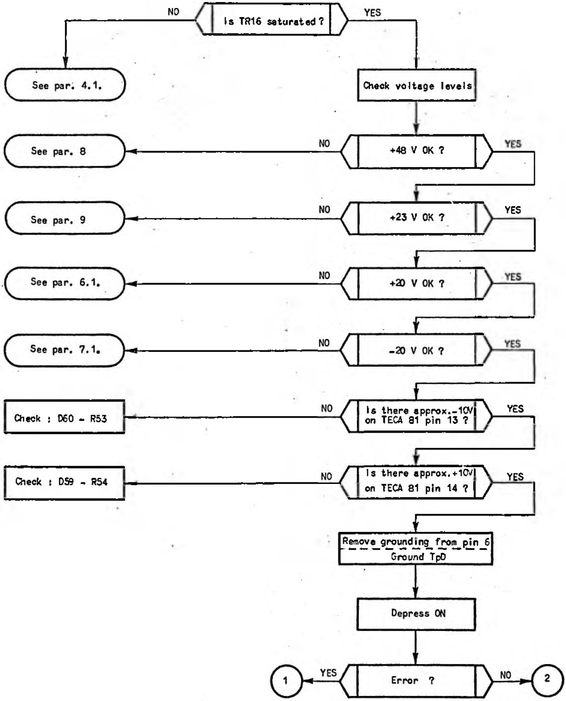


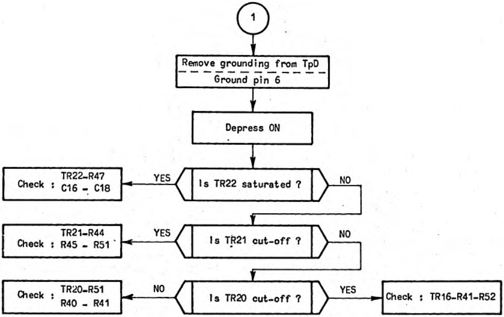
2.5. - PARTS LIST

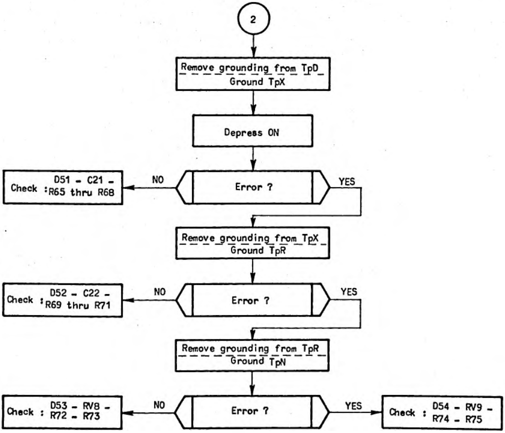
Component	Location	Logical and Electrical Functions
F7 thru F9	ALI 040	Fuses
F13 - F14	ALI 040	Fuses
H1 thru H3	CON 271	Fans
L	TAV 240	Lamp. Physically mounted in lower half of the OFF pushbutton. When lit, signals that the unit is switched off with presence of AC input voltages.
M1	ALI 040	Elapsed Time Counter.
OFF	TAV 240	Monostable pushbutton included in the TL1 hold-on circuit. When depressed, switches the unit off.
ON	TAV 240	Monostable pushbutton. When depressed energizes TL1.
R31	ALI 040	This resistor limits the energizing current of TL1.
RL3	ALI 040	Potter relay. Normally closed through TR14 in saturation. TL1 is held energized through RL3 contact 6-7 while contacts 11-9 issue the +20 R voltage to the DEM.
RL4	ALI 040	Potter relay. Energizes when RL5 closes. With contact 3-1 short circuits the ON pushbutton. Contact 5-6 inhibits the energizing of TL1 when the ON pushbutton is depressed.
RL5	ALI 040	Timing relay (≃ 3 sec.)
S01	CON 270	Rear unit door microswitch.
TL1	ALI 040	Main breaker.
TR14	ALI 040 (TECA 81)	Transistor. Normally in saturation holds RL3 energized. Cuts-off when the protection circuits are called upon.

3. NEGATIVE VOTLAGE VARIATION PROTECTION CIRCUIT

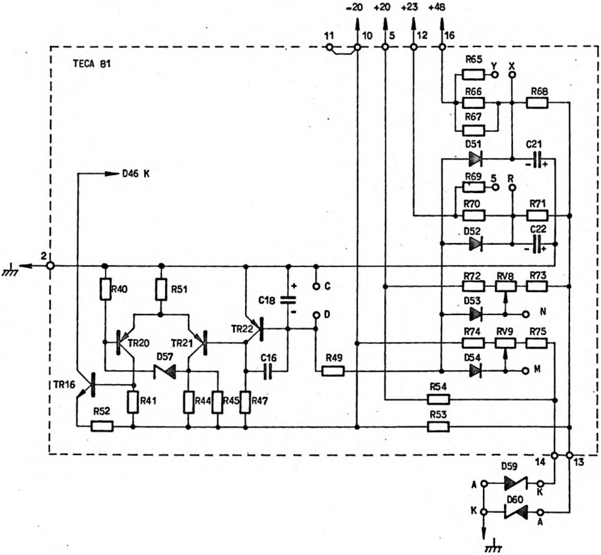
3.1. - FLOW CHART




1
Remove grounding from TpD
Ground pin 6
Depress ON
Is TR22 saturated ?
YES
NO
Check : TR22-R47 C16 - C18
Is TR21 cut-off ?
YES
NO
Check : TR21-R44 R45 - R51
Is TR20 cut-off ?
NO
YES
Check : TR20-R51 R40 - R41
Check : TR16-R41-R52


2
Remove grounding from TpD
Ground TpX
Depress ON
Error ?
NO
YES
Check : D51 - C21 - R65 thru R68
Remove grounding from TpX
Ground TpR
Error ?
NO
YES
Check : D52 - C22 - R69 thru R71
Remove grounding from TpR
Ground TpN
Error ?
NO
YES
Check : D53 - RV8 - R72 - R73
Check : D54 - RV9 - R74 - R75

3.2. - CIRCUIT DIAGRAM

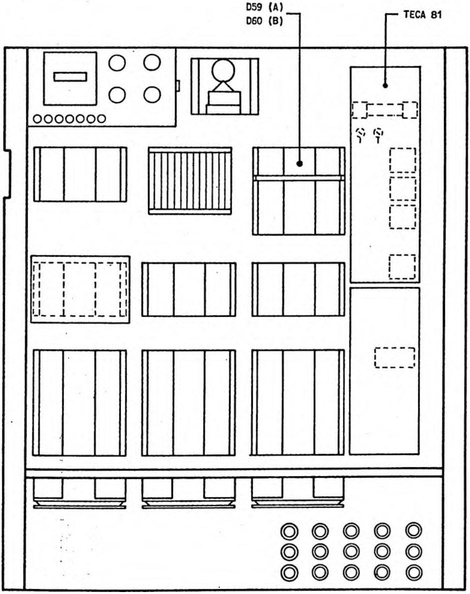


3.3. - MACHINE DOCUMENTATION REFERENCE

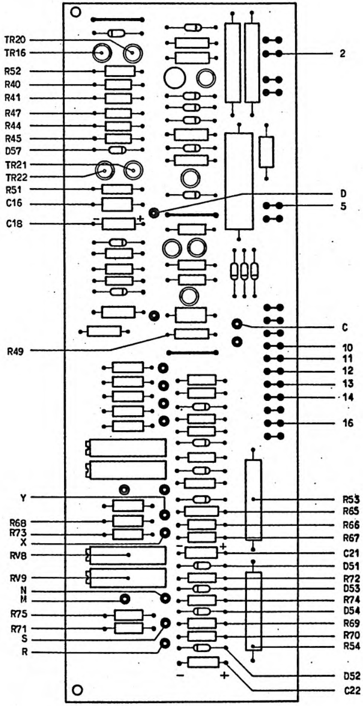
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
ALI 040 (TECA 81)	14453547

3.4. - COMPONENT LAYOUT

ALI 040 - Front View



ALI 040 - PWB TECA 81



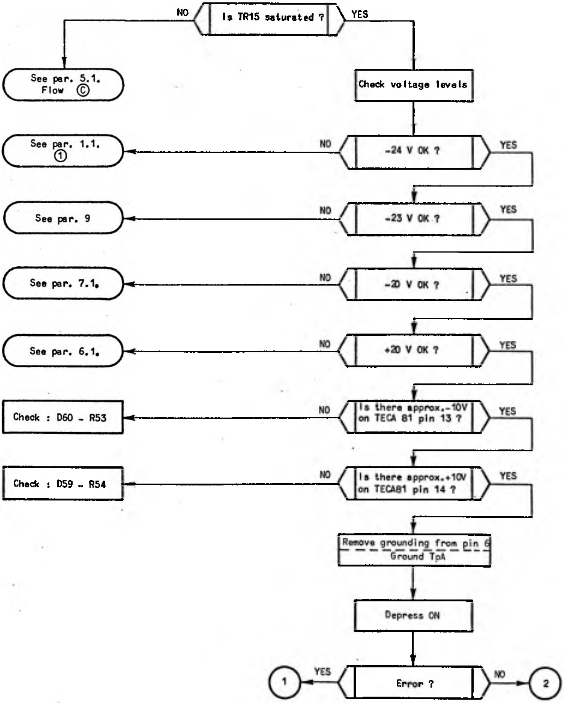
3.5. - PARTS LIST

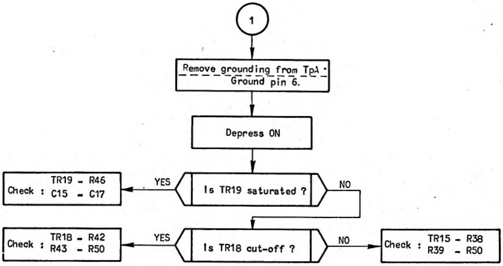
Component	Location	Logical and Electrical Functions
C16	ALI 040	TR22 feedback capacitor
C18-C21-C22	ALI 040	Capacitors
D51	ALI 040	+48 V divider network output diode
D52	ALI 040	+23 V divider network output diode
D53	ALI 040	+20 V divider network output diode
D54	ALI 040	-20 V divider network output diode
D57	ALI 040	Zener diode. Normally cut-off. Conducts when TR21 cuts-off.
D59	ALI 040	Zener diode. Used for generating the +10 V.
D60	ALI 040	Zener diode. Used for generating the -10 V.
R40-R41-R44-R45 R47-R49-R51-R52	ALI 040 (TECA 81)	Resistors.
R53	ALI 040 (TECA 81)	Load resistor towards -20 V, used for generating the -10 V through D60.
R54	ALI 040 (TECA 81)	Load resistor towards +20 V, used for generating the +10 V through D59.
R65	ALI 040 (TECA 81)	Resistor.
R66	ALI 040 (TECA 81)	Resistor. With R67-R68 forms the voltage divider that,between the +48 and -10 V, controls the +48 V negative variations.
R67 - R68	ALI 040 (TECA 81)	Resistors. See R66
R69	ALI 040 (TECA 81)	Resistor.

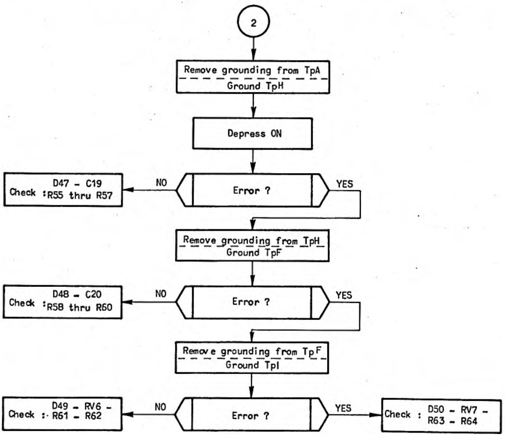
Component	Location	Logical and Electrical Functions
R70	ALI 040 (TECA 81)	Resistor. With R71 forms the voltage divider that, between the +23 and -10 V, controls the +23 V negative variations.
R71	ALI 040 (TECA 81)	Resistor. See R70
R72	ALI 040 (TECA 81)	Resistor. With RV8-R73 forms the voltage divider that, between the +20 and -10 V, controls the +20 V negative variations.
R73	ALI 040 (TECA 81)	Resistor. See R72
R74	ALI 040 (TECA 81)	Resistor. With RV9-R75 forms the voltage divider that, between the -20 and +10 V, controls the -20 V negative variations.
R75	ALI 040 (TECA 81)	Resistor. See R74
RV8	ALI 040 (TECA 81)	Pot. Used to adjust the +20 V negative variations protection circuit working point.
RV9	ALI 040 (TECA 81)	Pot. Used to adjust the -20 V negative variations protection circuit working point.
TR16	ALI 040 (TECA 81)	Transistor. Normally cut-off. Saturates when TR20 also saturates. Under these conditions the D58 cathode tends towards 0 V.
TR20	ALI 040 (TECA 81)	Transistor. Normally cut-off. Saturates when D57 conducts.
TR21	ALI 040 (TECA 81)	Transistor. Normally saturated. Cuts-off when TR22 saturates.
TR22	ALI 040 (TECA 81)	Transistor. Normally conducts. If a voltage goes under the set value, the transistor saturates.

4. POSITIVE VOLTAGE VARIATION PROTECTION CIRCUIT

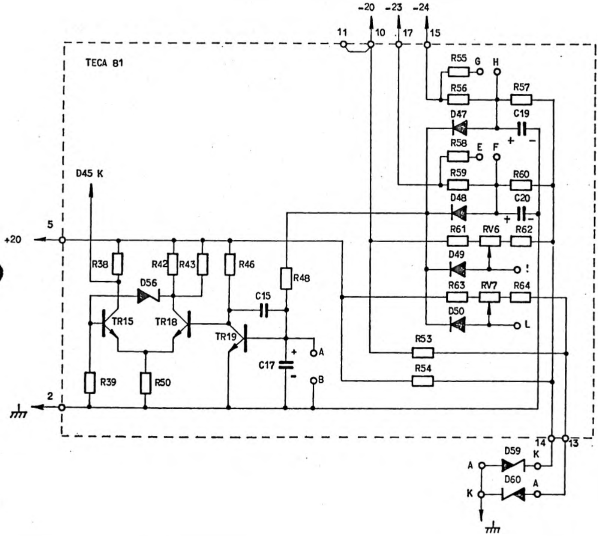
4.1. - FLOW CHART




1
Remove grounding from TpA
Ground pin 6.
Depress ON
Is TR19 saturated ?
YES
NO
Check : TR19 - R46 C15 - C17
Is TR18 cut-off ?
YES
NO
Check : TR18 - R42 R43 - R50
Check : TR15 - R38 R39 - R50


2
Remove grounding from TpA
Ground TpH
Depress ON
Error ?
NO
YES
Check : D47 - C19 R55 thru R57
Remove grounding from TpH
Ground TpF
Error ?
NO
YES
Check : D48 - C20 R58 thru R60
Remove grounding from TpF
Ground TpI
Error ?
NO
YES
Check : D49 - RV6 - R61 - R62
Check : D50 - RV7 - R63 - R64

4.2. - CIRCUIT DIAGRAM

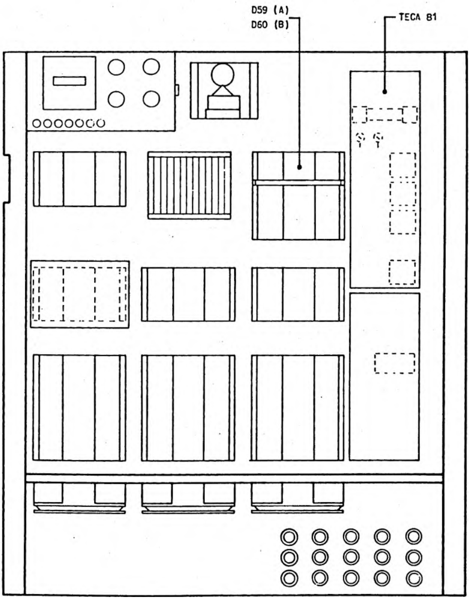


4.3. - MACHINE DOCUMENTATION REFERENCE

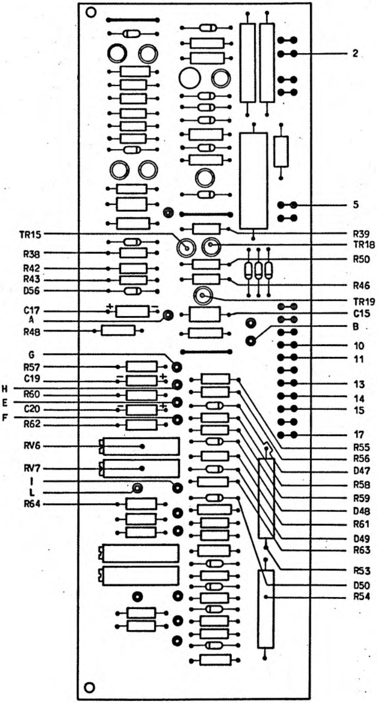
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
ALI 040 (TECA 81)	14453547

4.4. - COMPONENT LAYOUT

ALI 040 - Front View



ALI 040 - PWB TECA 81



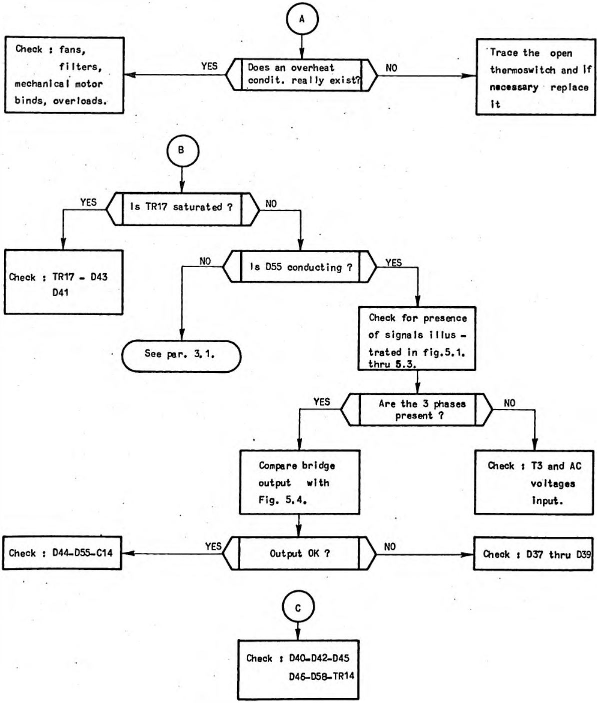
4.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
C15	ALI 040 (TECA 81)	TR19 feedback capacitor
C17-C19-C20	ALI 040 (TECA 81)	Capacitors
D47	ALI 040 (TECA 81)	-24 V divider network output diode
D48	ALI 040 (TECA 81)	-23 V divider network output diode
D49	ALI 040 (TECA 81)	-20 V divider network output diode
D50	ALI 040 (TECA 81)	+20 V divider network output diode
D56	ALI 040 (TECA 81)	Zener diode. Normally cut-off. Conducts when TR18 cuts-off.
D59	ALI 040	Zener diode. Used for generating the +10 V.
D60	ALI 040	Zener diode. Used for generating the -10 V.
R38-R39-R42-R43 R46-R48-R50	ALI 040 (TECA 81)	Resistors.
R53	ALI 040 (TECA 81)	Load resistor towards -20 V for generating the -10 V through D60.
R54	ALI 040 (TECA 81)	Load resistor towards +20 V for generating the +10 V through D59.
R55	ALI 040 (TECA 81)	Resistor.
R56	ALI 040 (TECA 81)	Resistor. With R57 forms the voltage divider that, between the -24 and +10 V, controls the -24 V positive variations.
R57	ALI 040 (TECA 81)	Resistor. See R56.

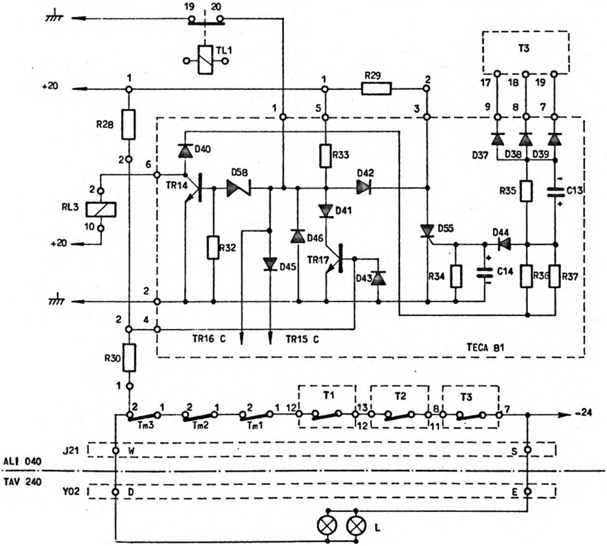
Component	Location	Logical and Electrical Functions
R58	ALI 040 (TECA 81)	Resistor.
R59	ALI 040 (TECA 81)	Resistor. With R60 forms the voltage divider that, between the -23 and +10 V, controls the -23 V positive variations.
R60	ALI 040 (TECA 81)	Resistor. See R59.
R61	ALI 040 (TECA 81)	Resistor. With RV6-R62 forms the voltage divider that, between the -20 and +10 V, controls the -20 V positive variations.
R62	ALI 040 (TECA 81)	Resistor. See R61.
R63	ALI 040 (TECA 81)	Resistor. With RV7-R64 forms the voltage divider that, between the +20 and -10 V, controls the +20 V positive variations.
R64	ALI 040 (TECA 81)	Resistor. See R63.
RV6	ALI 040 (TECA 81)	Pot. Used to adjust the -20 V positive variations protection circuit working point.
RV7	ALI 040 (TECA 81)	Pot. Used to adjust the working point of the +20 V positive variations protection circuit.
TR15	ALI 040 (TECA 81)	Transistor. Normally cut-off. Saturates when D56 conducts.
TR18	ALI 040 (TECA 81)	Transistor. Normally saturated. Cuts-off when TR19 saturates.
TR19	ALI 040 (TECA 81)	Transitor. Normally conducts.When a voltage rises above the set level the transistor saturates.

5. PHASE FALL AND OVERTEMPERATURE PROTECTION CIRCUIT

5.1. - FLOW CHART


A
Does an overheat condit. really exist?
YES
Check : fans, filters, mechanical motor binds, overloads.
NO
Trace the open thermoswitch and if necessary replace it
B
Is TR17 saturated ?
YES
Check : TR17 - D43 D41
NO
Is D55 conducting ?
NO
See par. 3.1.
YES
Check for presence of signals illus - trated in fig.5.1. thru 5.3.
Are the 3 phases present ?
YES
Compare bridge output with Fig. 5.4.
NO
Check : T3 and AC voltages input.
Output OK ?
YES
Check : D44-D55-C14
NO
Check : D37 thru D39
C
Check : D40-D42-D45 D46-D58-TR14

5.2. - CIRCUIT DIAGRAM

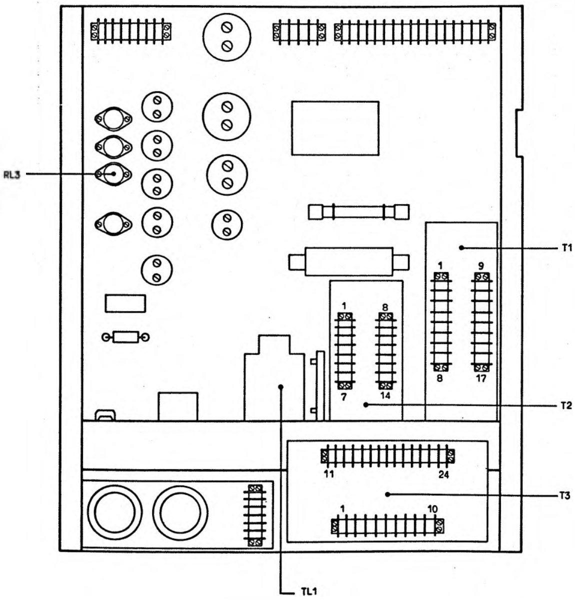


5.3. - MACHINE DOCUMENTATION REFERENCE

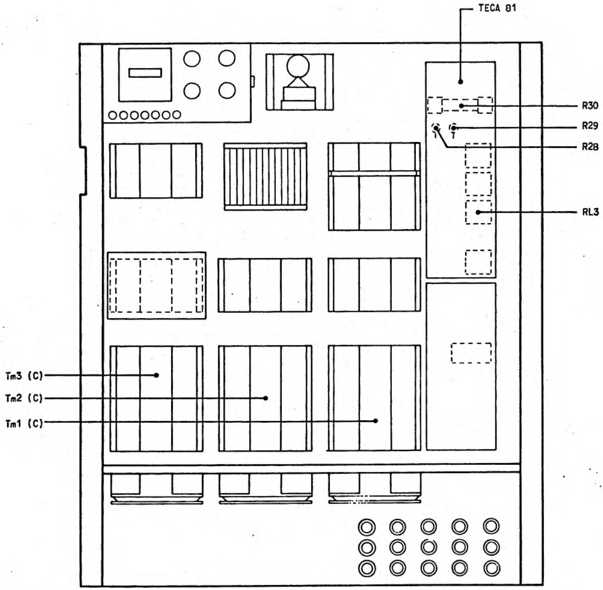
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219 - 2220)
ALI 040 (TECA 81)	14453547
TAV 240	14033011

5.4. - COMPONENT LAYOUT

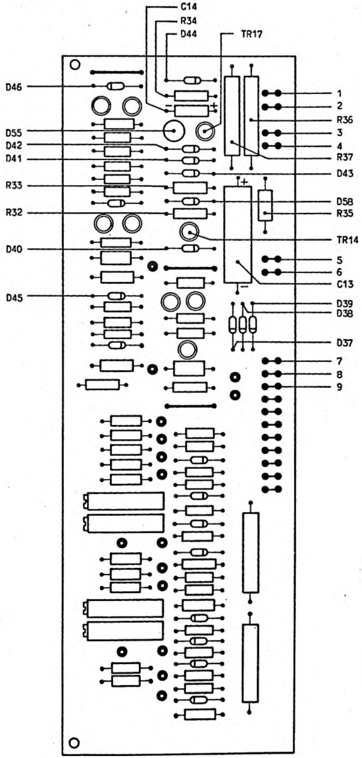
ALI 040 - Rear View



ALI 040 - Front View



ALI 040 - PWB TECA 81

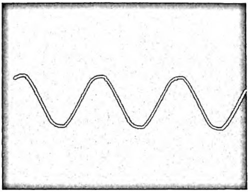


5.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
C13 - C14	ALI 040 (TECA 81)	Capacitors.
D37 thru D39	ALI 040 (TECA 81)	Bridged diodes. Used in the phase fall protection circuit.
D40 thru D42	ALI 040 (TECA 81)	Diodes
D43	ALI 040 (TECA 81)	Diode. Normally holds TR17 cut - off by negatively biasing its base with respect to the emitter.
D44	ALI 040 (TECA 81)	DSS - SCR drive diode.
D45 - D46	ALI 040 (TECA 81)	Diodes.
D55	ALI 040 (TECA 81)	SCR Diode. Conducts when, in case of a phase fall, the divider output goes positive.
D58	ALI 040 (TECA 81)	Zener Diode. Normally conducts. Cuts-off whenever a protection circuit is called upon.
L	TAV 240	Physically mounted in the upper half of the OFF pushbutton. Signals an overtemperature condition upon opening of one of the thermoswitches.
R28	ALI 040	Resistor. Connected with R30,forms the TR17 base divider between the +20 and -24 V (through the thermoswitches). If a thermoswitch opens, the base becomes positive.
R29	ALI 040	Resistor.
R30	ALI 040	Resistor. See R28.
R32 thru R34	ALI 040 (TECA 81)	Resistors. Form the pahse fall protection voltage divider.

Component	Location	Logical and Electrical Functions
RL3	ALI 040	Potter relay. Normally closed, holds TL1 energized. De-energizes whenever a protection circuit is called upon.
T1 thru T3	ALI 040	Thermoswitches. Physically mounted on the primary windings of their respectively called transformers. Open when temperature rises above 105°C.
T3	ALI 040	Transformer. The same secondary used for the phase fall protection (output terminals 17-18-19) is also used for the +23 and -23 V generation circuits.
TL1	ALI 040	Main breaker. Contact 19-20 grounds the D58 cathode, inhibiting the protections to be called upon during the units switch-on phase.
Tm1	ALI 040	Capstan motor control circuit protection thermoswitch. Fitted on the TR23 thru TR25 heat sink. Opens when temperature rises above 75°C.
Tm2	ALI 040	Reel motor control circuit protection thermoswitch. Fitted on the TR29 thru TR31 heat sink. Opens when temperature rises above 75°C.
Tm3	ALI 040	+20 V adjust circuit protection thermoswitch. Fitted on the TR3 thru TR5 heat sink. Opens when temperature rises above 75°C.
TR14	ALI 040 (TECA 81)	Transistor. Normally saturated, holds RL3 energized. Only cuts-off when the protection circuits are called upon.

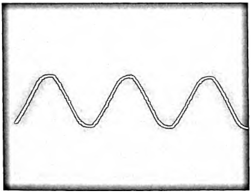
Component	Location	Logical and Electrical Functions
TR17	ALI 040 (TECA 81)	Transistor. Normally cut-off. Saturates whenever a thermoswitch opens.



Scope sync on : D37 K

Scales : 5 ms/cm
20 V /cm

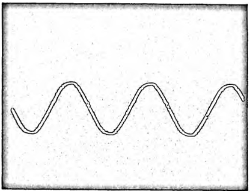
Fig. 5.1. - TECA 81 - D37 K



Scope sync on : D37 K

Scales : 5 ms/cm
20 V /cm

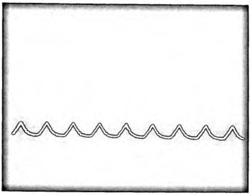
Fig. 5.2. - TECA 81 - D38 K



Scope sync on : D37 K

Scales : 5 ms/cm
20 V /cm

Fig. 5.3. - TECA 81 - D39 K



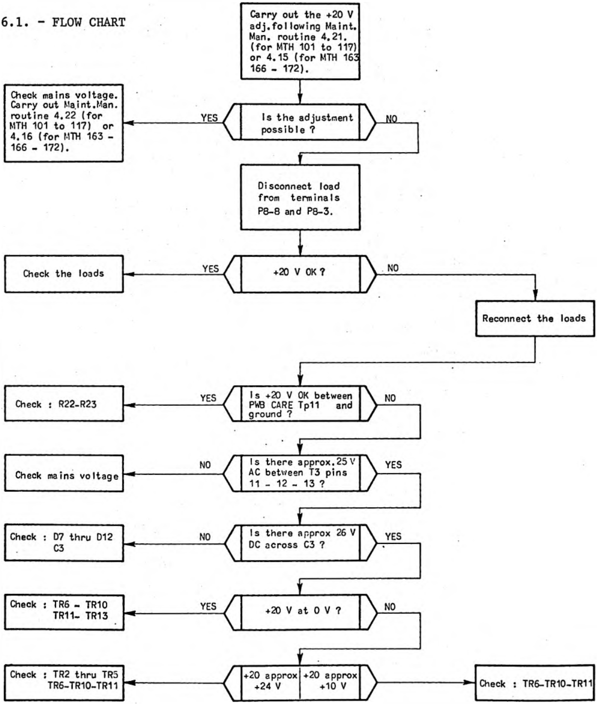
Scope sync on : D37 K

Scales : 5 ms/cm
20 V /cm

Fig. 5.4. - TECA 81 - D37-38-39 A

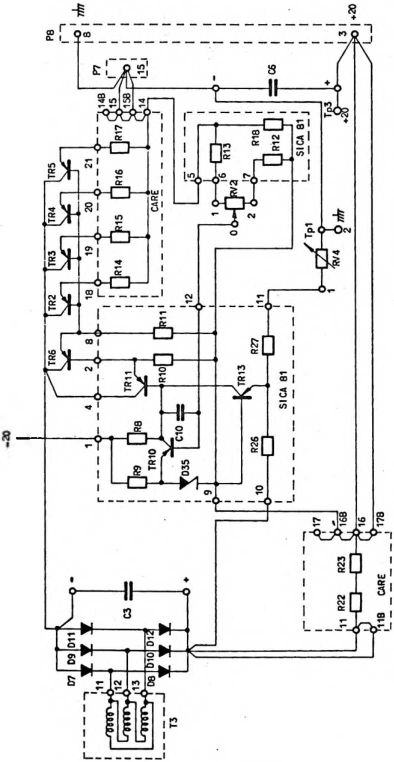
6. +20 V POWER SUPPLY

6.1. - FLOW CHART


Carry out the +20 V adj.following Maint. Man. routine 4.21. (for MTH 101 to 117) or 4.15 (for MTH 163 166 - 172).
Is the adjustment possible ?
YES
Check mains voltage. Carry out Maint.Man. routine 4.22 (for MTH 101 to 117) or 4.16 (for MTH 163 - 166 - 172).
NO
Disconnect load from terminals P8-8 and P8-3.
+20 V OK ?
YES
Check the loads
NO
Reconnect the loads
Is +20 V OK between PWB CARE Tp11 and ground ?
YES
Check : R22-R23
NO
Is there approx.25 V AC between T3 pins 11 - 12 - 13 ?
NO
Check mains voltage
YES
Is there approx 26 V DC across C3 ?
NO
Check : D7 thru D12 C3
YES
+20 V at 0 V ?
YES
Check : TR6 - TR10 TR11- TR13
NO
+20 approx +24 V
+20 approx +10 V
Check : TR2 thru TR5 TR6-TR10-TR11
Check : TR6-TR10-TR11

N.B. - Upon completion of this procedure, carry out the +20 V adjustment according to the appropriate Maint. Manual routine.

6.2. - CIRCUIT DIAGRAM

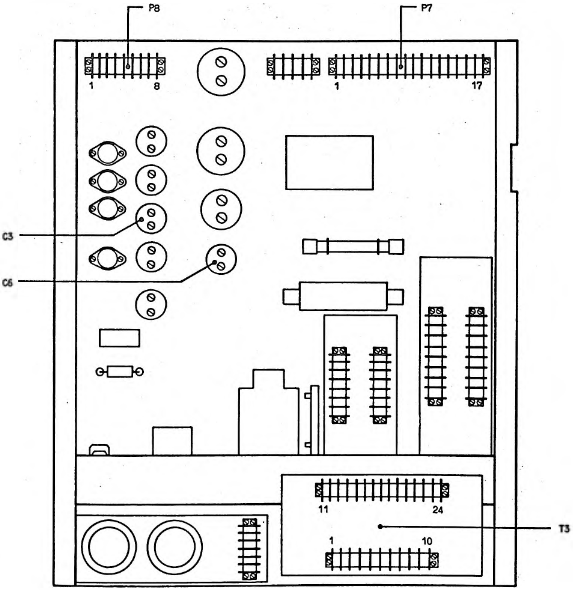


6.3. - MACHINE DOCUMENTATION REFERENCE

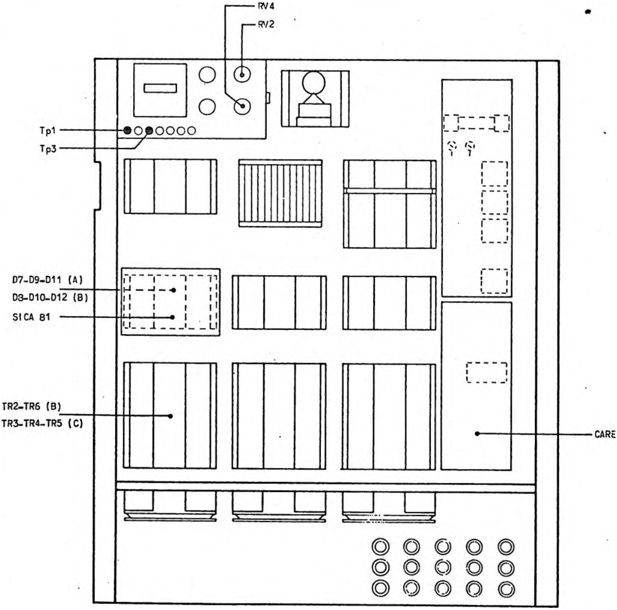
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2221)
ALI 040 (CARE)	14453546
ALI 040 (SICA 81)	14453968

6.4. - COMPONENT LAYOUT

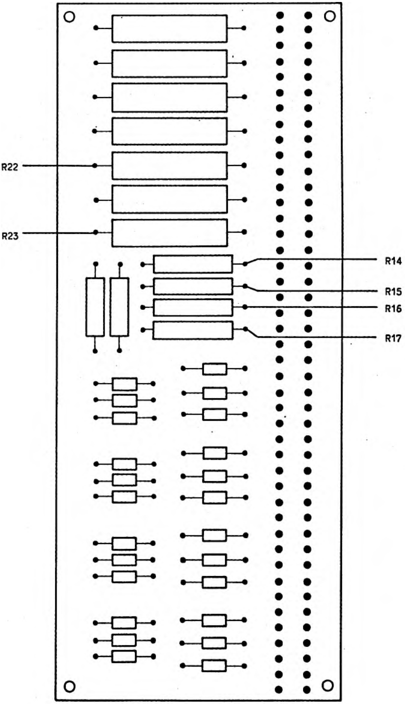
ALI 040 - Rear View



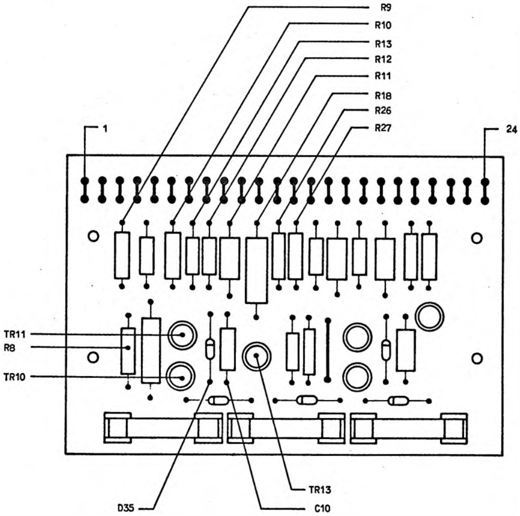
ALI 040 - Front View



ALI 040 - PWB CARE



ALI 040 - PWB SICA 81



6.5. - PARTS LIST

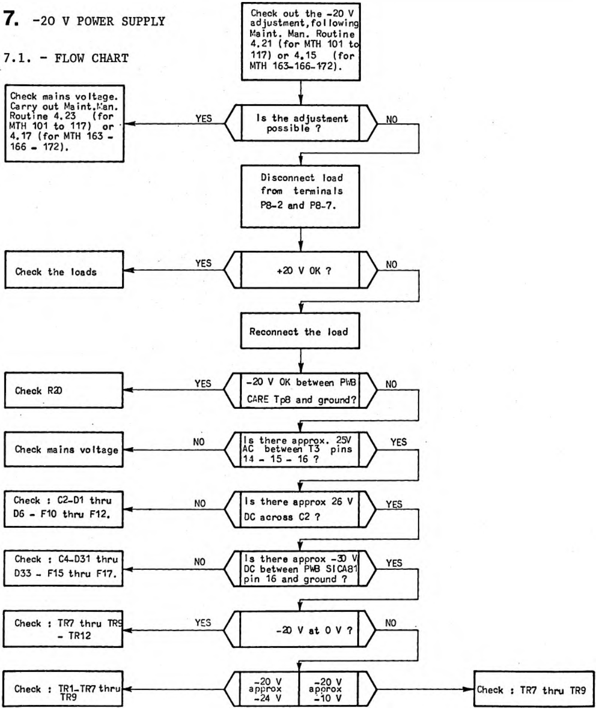
Component	Location	Logical and Electrical Functions
C3 - C6	ALI 040	+20 V filter capacitors.
C10	ALI 040 (SICA 81)	TR10 feedback capacitor.
D7 to D12	ALI 040	Bridged diodes. Used to generate the +20 V.
D35	ALI 040 (SICA 81)	Zener diode. Used to obtain a constant voltage level utilized by the +20 V adjust circuit.
R8	ALI 040 (SICA 81)	TR10 and TR13 load resistor.
R9 to R11	ALI 040 (SICA 81)	Resistors.
R12	ALI 040 (SICA 81)	Resistor. With RV2 - R13, forms a divider that outputs a voltage level proportional to the +20 value. Also compared with the voltage issued by D35.
R13	ALI 040 (SICA 81)	Resistor. See R12.
R14 to R17	ALI 040 (CARE)	Resistors. Act as feedback resistors on the TR2 to TR5 emitters so as to adapt the transistors gain.
R18	ALI 040 (SICA 81)	Resistor.
R22	ALI 040 (CARE)	Resistor. With R23 it is series connected to the load. Voltage drops across R22-R23 bias the base of TR13 which, under normal load conditions, must result positive with respect to the emitter.
R23	ALI 040 (CARE)	Resistor. See R22.

Component	Location	Logical and Electrical Functions
R26	ALI 040 (SICA 81)	Resistor. With R27 - RV4, forms a divider that biases the TR13 emitter.
R27	ALI 040 (SICA 81)	Resistor. See R26.
RV2	ALI 040	Pot. See R12. RV2 adjustment varies the error voltage and consequently the +20 V output value.
RV4	ALI 040	Pot. See R26. Used to vary the TR13 emitter biasing voltage and therefore the current limiter circuit working point.
T3	ALI 040	Transformer.
Tp1	ALI 040	Test point (⏚).
Tp3	ALI 040	Test point (+20 V).
TR2 to TR5	ALI 040	+20 V adjustment "series" transistors. The emitter resistance of these transistors is derived from the Power Supply load. Normally conducts and increases its conduction as the +20 decreases.
TR6	ALI 040	Transistor. Normally conducting, increases its conduction as the +20 output increases. In this way the TR2 to TR5"series" transistors conduct less,bringing the output to its nominal value once more.
TR10	ALI 040 (SICA 81)	Transistor. Used to compare the R12 - RV2 - R13 divider output voltage (issued to the base) with the constant D35 voltage (applied to the emitter). If the +20 rises, the collector current also rises and viceversa.

Component	Location	Logical and Electrical Functions
TR11	ALI 040 (SICA 81)	Transistor. An emitter-follower that supplies the necessary current to drive the power circuit. Increases its conduction as the +20 V increases.
TR13	ALI 040 (SICA 81)	Transistor. During normal conditions (output current < than the max.) it is cut-off. When overload conditions prevail it conducts, causing to lower the error voltage and consequently the output voltage.

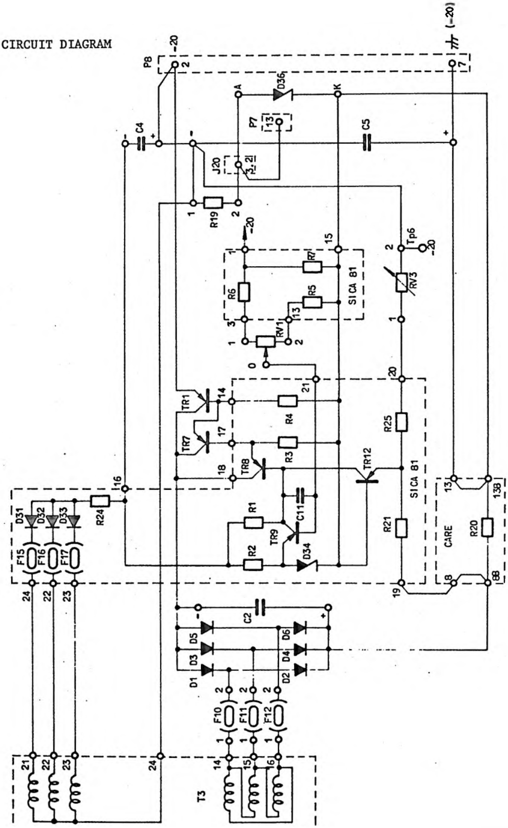
7. -20 V POWER SUPPLY

7.1. - FLOW CHART


Check out the -20 V adjustment, following Maint. Man. Routine 4.21 (for MTH 101 to 117) or 4.15 (for MTH 163-166-172).
Is the adjustment possible ?
YES
NO
Check mains voltage. Carry out Maint.Man. Routine 4.23 (for MTH 101 to 117) or 4.17 (for MTH 163 - 166 - 172).
Disconnect load from terminals P8-2 and P8-7.
+20 V OK ?
YES
NO
Check the loads
Reconnect the load
-20 V OK between PWB CARE Tp8 and ground?
YES
NO
Check R20
Is there approx. 25V AC between T3 pins 14 - 15 - 16 ?
NO
YES
Check mains voltage
Is there approx 26 V DC across C2 ?
NO
YES
Check : C2-D1 thru D6 - F10 thru F12.
Is there approx -30 V DC between PWB SICA81 pin 16 and ground ?
NO
YES
Check : C4-D31 thru D33 - F15 thru F17.
-20 V at 0 V ?
YES
NO
Check : TR7 thru TR9 - TR12
-20 V approx -24 V
-20 V approx -10 V
Check : TR1-TR7 thru TR9
Check : TR7 thru TR9

N.B. - Upon completion of this procedure, carry out the -20 V adjustment according to the appropriate Maint. Manual routine.

7.2. - CIRCUIT DIAGRAM

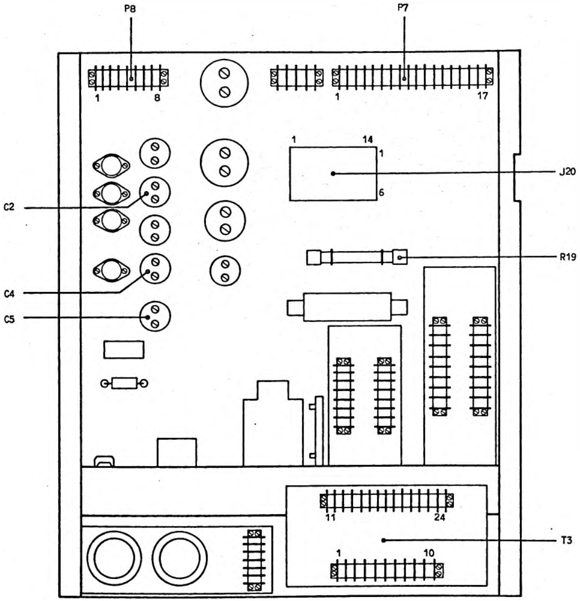


7.3. - MACHINE DOCUMENTATION REFERENCE

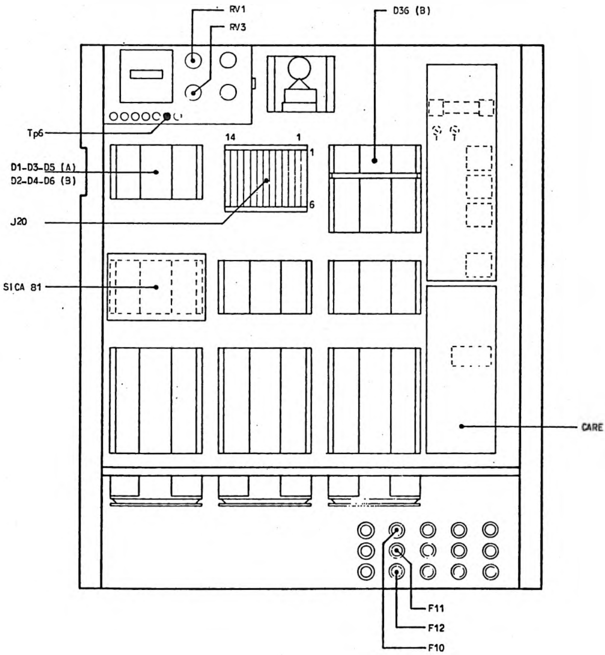
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2221)
ALI 040 (CARE)	14453546
ALI 040 (SICA 81)	14453968

7.4. - COMPONENT LAYOUT

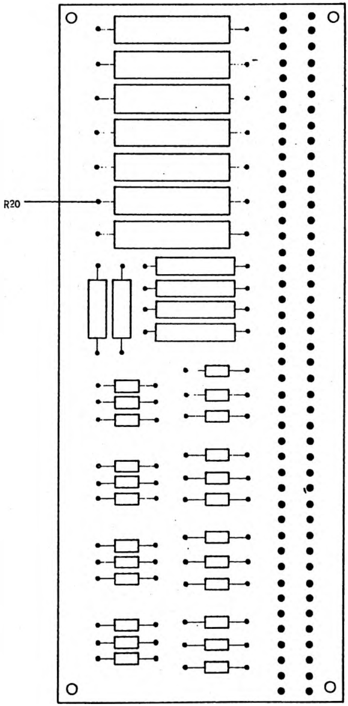
ALI 040 - Rear View



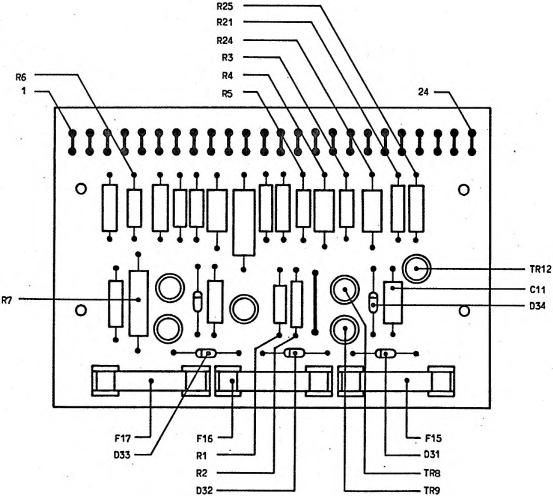
ALI 040 - Front View



ALI 040 - PWB CARE



ALI 040 - PWB SICA 81



7.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
C2	ALI 040	-20 V filter capacitor.
C4	ALI 040	-30 V filter capacitor.
C5	ALI 040	-20 V filter capacitor.
C11	ALI 040 (SICA 81)	TR9 feedback capacitor.
D1 to D6	ALI 040	Bridged diodes. Used for generating the -20 V.
D31 to D33	ALI 040 (SICA 81)	Bridged diodes. Used for generating the -30 auxiliary voltage.
D34	ALI 040 (SICA 81)	Zener diode. Used to obtain a constant voltage in turn utilized by the -20 V adjust circuit.
D36	ALI 040	Zener diode. Used for generating the -5.5 V.
F10 to F12	ALI 040	-20 V fuses.
F15 to F17	ALI 040 (SICA 81)	-30 V fuses.
R1	ALI 040 (SICA 81)	TR9 and TR12 load resistor.
R2 to R4	ALI 040 (SICA 81)	Resistors.
R5	ALI 040 (SICA 81)	Resistor. With RV1-R6 forms a divider the output of which, proportional to the -20 V, is compared with the voltage issued by D34.
R6	ALI 040 (SICA 81)	Resistor. See R5.
R7	ALI 040 (SICA 81)	Resistor.
R19	ALI 040	Resistor.

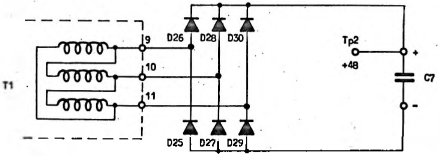
Component	Location	Logical and Electrical Functions
R20	ALI 040 (CARE)	Resistor. Series connected to the load. The voltage drop across the resistor biases the base of TR12 which, under normal load conditions, must result positive with respect to the emitter.
R21	ALI 040 (SICA 81)	Resistor. With R25-RV3, forms a divider that biases the emitter of TR12.
R24	ALI 040 (SICA 81)	Resistor.
R25	ALI 040 (SICA 81)	Resistor. See R21.
RV1	ALI 040	Pot. See R5. RV1 adjustments vary the error voltage and therefore the -20 V output value.
RV3	ALI 040	Pot. See R21. Used to vary the TR12 emitter biasing voltage and therefore the working point of the current limiter circuit.
T3	ALI 040	Transformer.
Tp6	ALI 040	Test point. (-20 V).
TR1	ALI 040	-20 V adjustment "series" transistor, the emitter resistance of which is derived from the Power Supply load. Normally conducting, increases its conduction as the -20 V decreases.
TR7	ALI 040	Transistor. Normally conducts and increases its conduction as the -20 output increases. In this way "series" transistor TR1 conducts less, bringing the output to its nominal value once more.

Component	Location	Logical and Electrical Functions
TR8	ALI 040 (SICA 81)	Transistor.. An emitter-follower supplying the current necessary to drive the power circuit. Increases its conduction as the -20 V increases.
TR9	ALI 040 (SICA 81)	Transistor. Used to compare the R5-RV1-R6 divider output voltage (applied to the base) with the constant D34 voltage (applied to the emitter). If the -20 V rises, the collector current also rises and viceversa.
TR12	ALI 040 (SICA 81)	Transistor. During normal conditions (output current < than the max.) it is cut-off. When overload conditions prevail it conducts, causing to lower the error voltage and consequently the output voltage.

8. +48 V POWER SUPPLY

> Should any malfunctions occur, carefully check the components shown in the below illustrated circuit.

8.1. - CIRCUIT DIAGRAM

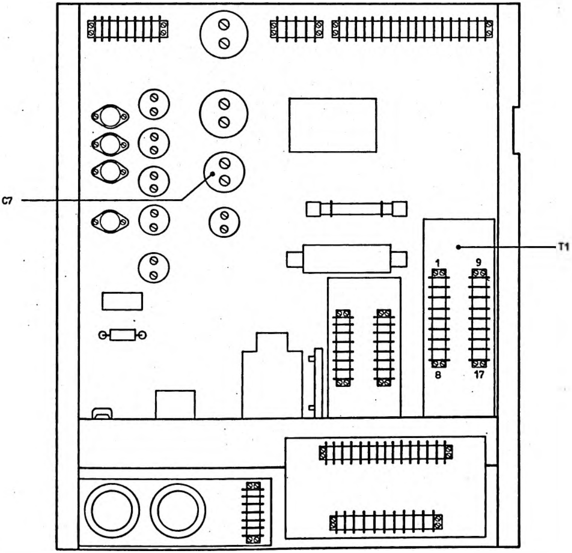


8.2. - MACHINE DOCUMENTATION REFERENCE

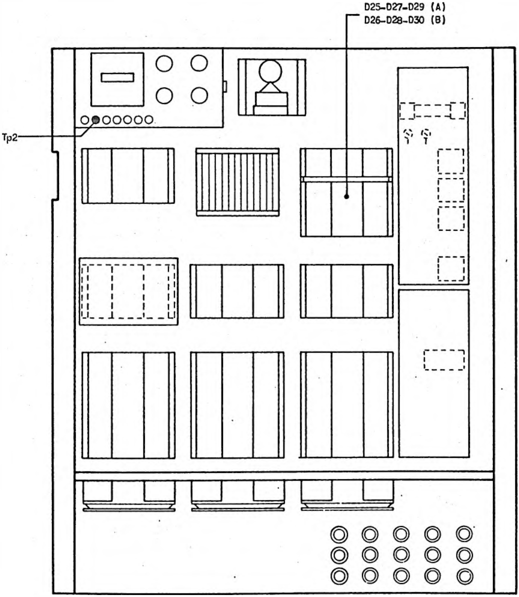
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)

8.3. - COMPONENT LAYOUT

ALI 040 - Rear View



ALI 040 - Front View



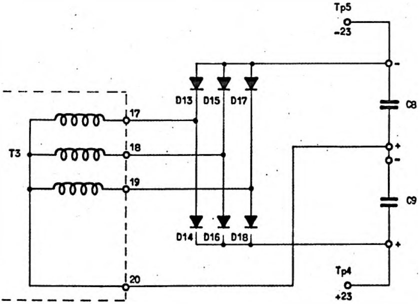
8.4. - PARTS LIST

Component	Location	Logical and Electrical Functions
C7	ALI 040	+48 V filter capacitor
D25 to D30	ALI 040	Bridged diodes. Used for generating the +48 V.
T1	ALI 040	Transformer.
Tp2	ALI 040	Test point (+48 V).

9. +23 V and -23 V POWER SUPPLY

> Should any malfunctions occur, carefully check the components shown in the below illustrated circuit.

9.1. - CIRCUIT DIAGRAM

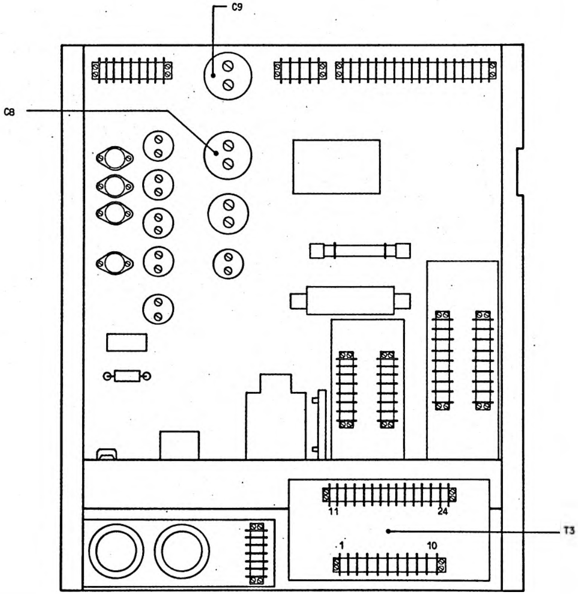


9.2. - MACHINE DOCUMENTATION REFERENCE

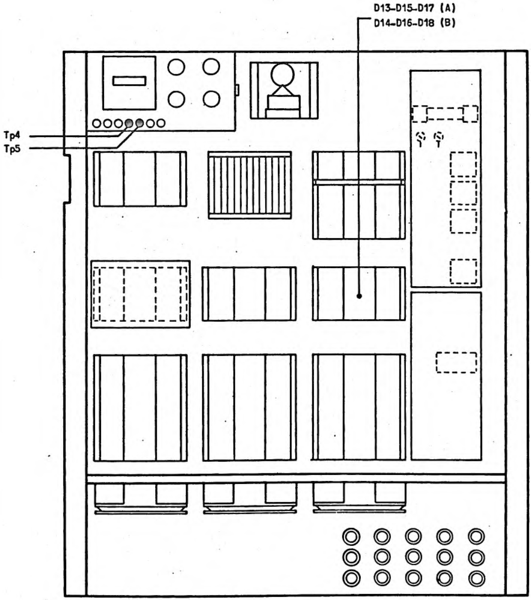
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)

9.3. - COMPONENT LAYOUT

ALI 040 - Rear View



ALI 040 - Front View

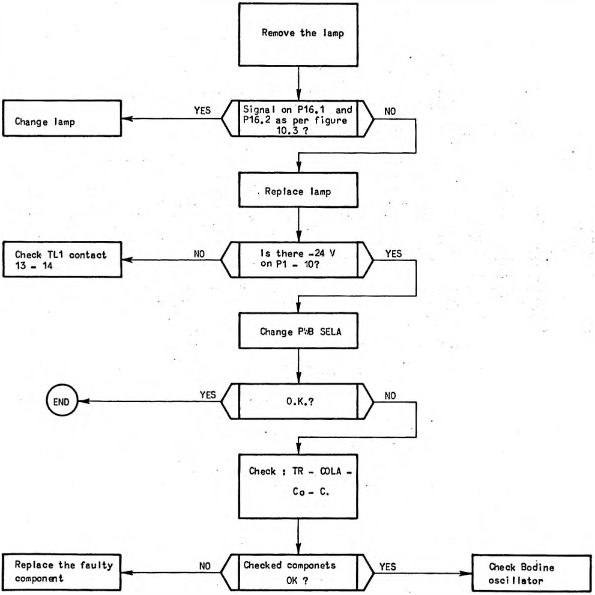


9.4. - PARTS LIST

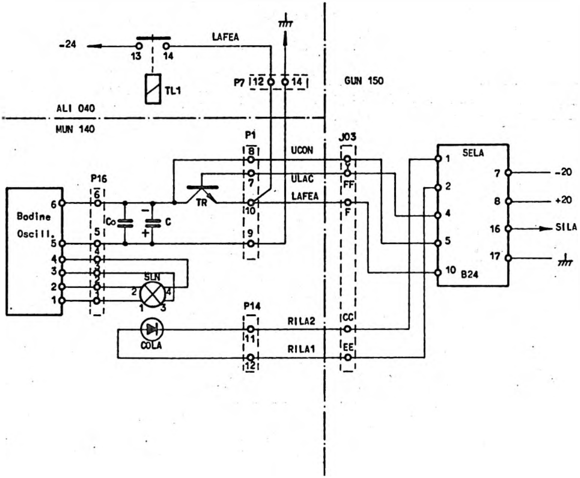
Component	Location	Logical and Electrical Functions
C8	ALI 040	-23 V filter capacitor.
C9	ALI 040	+23 V filter capacitor.
D13 - D15 - D17	ALI 040	Bridged diodes. Used for generating the -23 V.
D14 - D16 - D18	ALI 040	Bridged diodes. Used for generating the +23 V.
T3	ALI 040	Transformer.
Tp4	ALI 040	Test point (+23 V).
Tp5	ALI 040	Test point (-23 V).

10. SWITCH-ON and SERVO-BIN LAMP CIRCUIT

10.1. - FLOW CHART


Remove the lamp
Change lamp
YES
Signal on P16.1 and P16.2 as per figure 10.3 ?
NO
Replace lamp
Check TL1 contact 13 - 14
NO
Is there -24 V on P1 - 10?
YES
Change PWB SELA
END
YES
O.K.?
NO
Check : TR - COLA - Co - C.
Replace the faulty component
NO
Checked componets OK ?
YES
Check Bodine oscillator

10.2. - CIRCUIT DIAGRAM

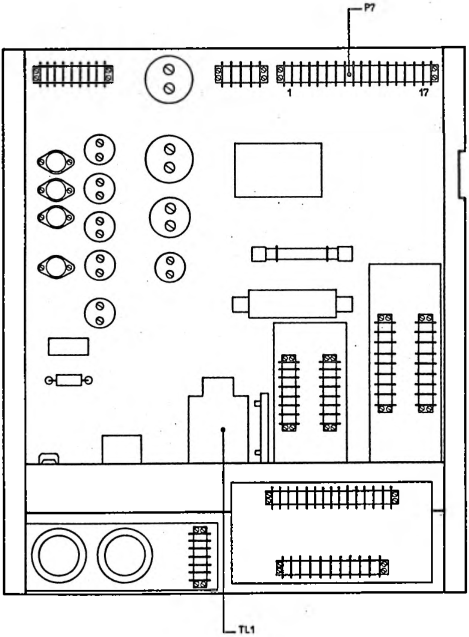


10.3. - MACHINE DOCUMENTATION REFERENCE

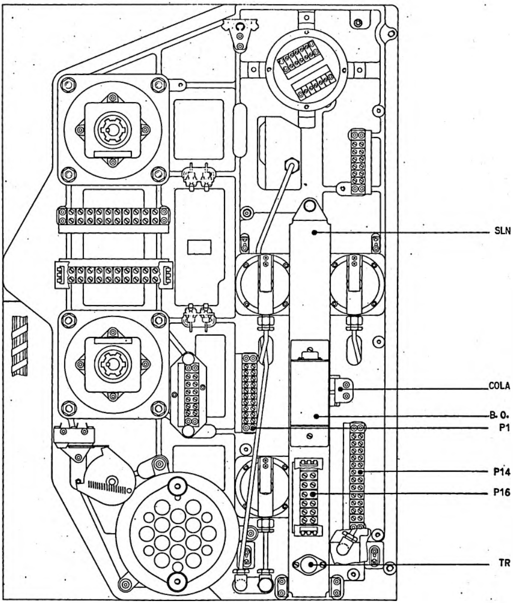
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
GUN 150	14312056 (Ch. 2201 - 2208)
MUN 140	22932005

10.4. - COMPONENT LAYOUT

ALI 040 - Rear View



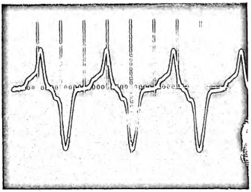
MUN 140



N.B. - Capacitors C and Co are physically located behind the hinged lamp support.

10.5. - PARTS LIST

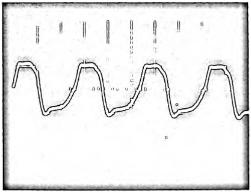
Component	Location	Logical and Electrical Functions
C - Co	MUN 140	Capacitors.
COLA	MUN 140	Control photodiode. Its rate of conduction is directly proportional to the brightness of the bin lamp.
B.O.	MUN 140	Bodine Oscillator. Supplies the fluorescent lamp.
SELA	GUN 150	Bin lamp brightness control PWB. Driven by photodiode COLA. Outputs signals UCON and ULAC that in turn drive the TR "series" transistor. Present on pin 16 is signal SILA (usually at "0") which goes to "1" when either the lamp goes out or when the "series" transistor no longer controls the lamp (TR in saturation).
SLN	MUN 140	Fluorescent lamp.
TL1	ALI 040	Main breaker. Through its contact 13-14, issues the -24 V (LAFEA) that drives the TR"series" transistor.
TR	MUN 140	"Series" transistor driven by signal ULAC. Used to vary the oscillators supply voltage depending upon the lamp brightness. If brightness decreases it passes to a greater conduction and viceversa.



Scope sync on : INT - AUTO

Scales : 20 us/cm -50 V/cm

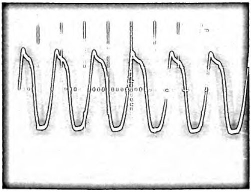
Fig. 10.1. - P 16-1 o P 16-2 (with load)



Scope sync on : INT - AUTO

Scales : 20 us/cm -5 V/cm

Fig. 10.2. - P 16-3 (with load)



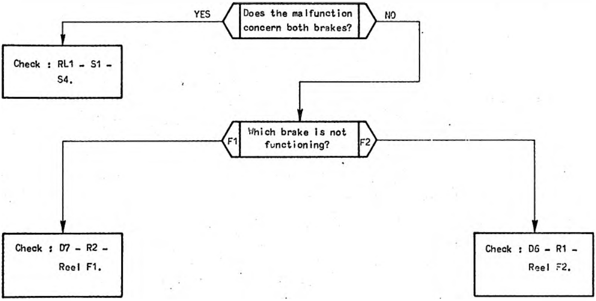
Scope sync on : INT - AUTO

Scales : 20 us/cm -200 V/cm

Fig. 10.3. - P 16-1 o P 16-2 (without load)

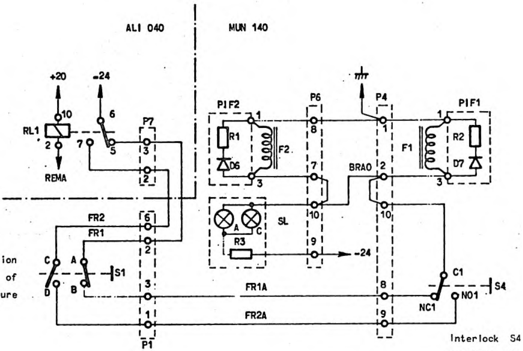
11. REEL BRAKES CONTROL CIRCUIT

11.1. - FLOW CHART


Does the malfunction concern both brakes?
YES
NO
Check : RL1 - S1 - S4.
Which brake is not functioning?
F1
F2
Check : D7 - R2 - Reel F1.
Check : D6 - R1 - Reel F2.

N.B. - Remember that when the brakes are energized, the reels are free to turn and that when the SL lamp is lit, the reels are blocked.

11.2. - CIRCUIT DIAGRAM



Switch position in absence of vacuum pressure

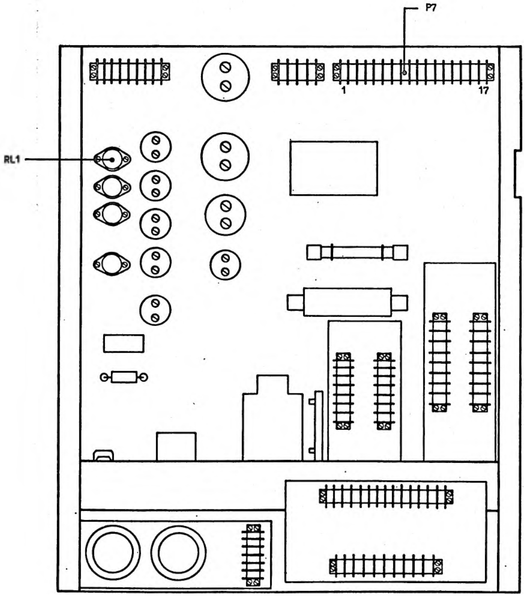
Interlock S4 position with upper bin cover open.

11.3. - MACHINE DOCUMENTATION REFERENCE

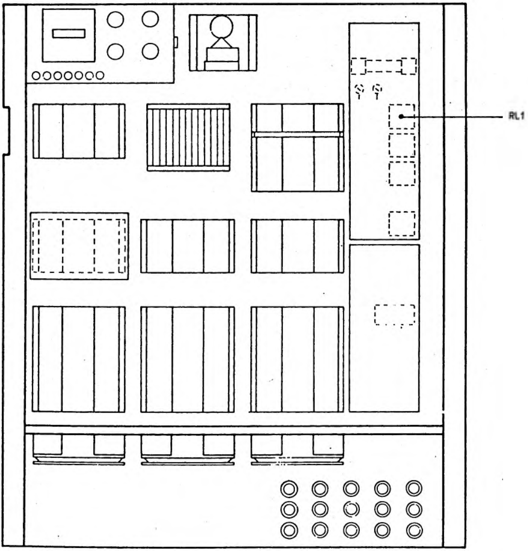
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
MUN 140	22932005

11.4. - COMPONENT LAYOUT

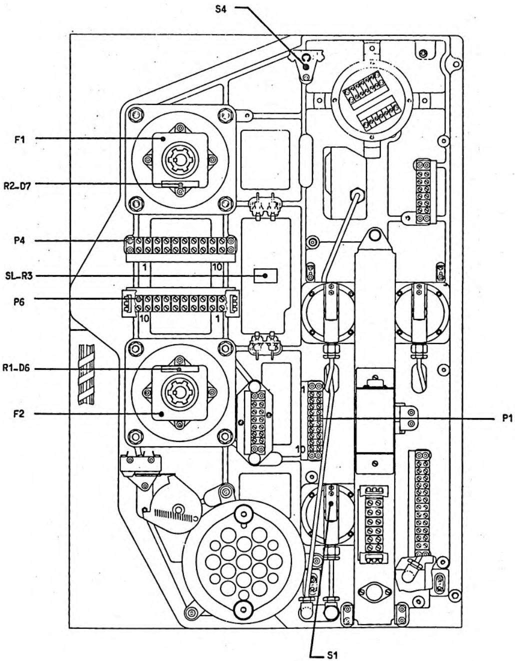
ALI 040 - Rear View



ALI 040 - Front View



MUN 140

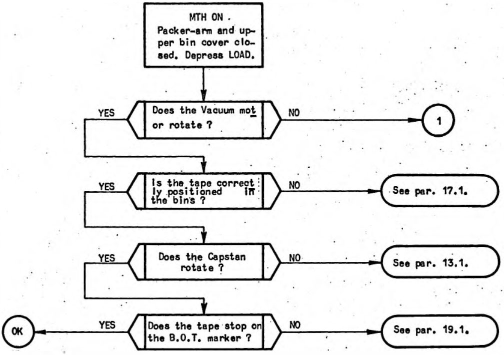


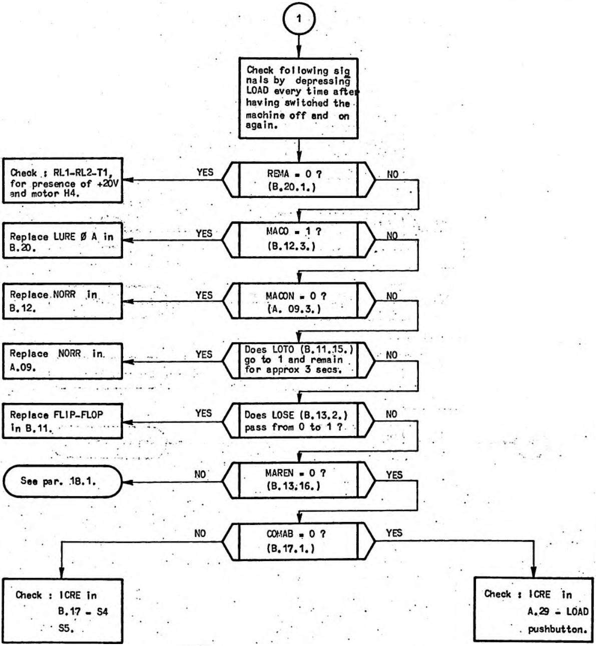
11.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
D6 - D7	MUN 140	Diodes.
F1	MUN 140	Upper reel brake. When energized it frees the reel.
F2	MUN 140	Lower reel brake. When energized it frees the reel.
R1 to R3	MUN 140	Resistors.
RL1	ALI 040	Potter relay. It is energized upon loading operations and remains held on until the handler goes into the Out of Service status.
S1	MUN 140	Pneumatic reference switch. Functions when bin vacuum pressure level reaches approx. 70% of its nominal value.
S4	MUN 140	Upper bin cover interlock switch.
SL	MUN 140	Brakes indicator lamps. Light when the brakes are not energized.

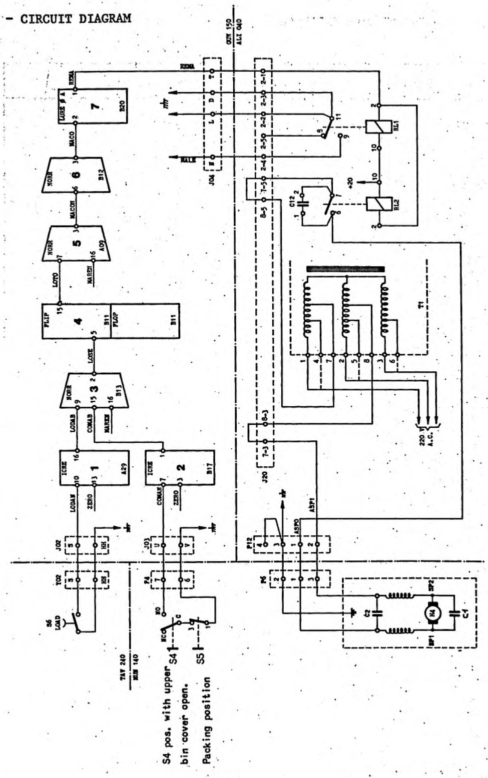
12. LOAD START and VACUUM MOTOR CIRCUIT

12.1. - FLOW CHART


MTH ON . Packer-arm and upper bin cover closed. Depress LOAD.
Does the Vacuum motor rotate ?
YES
NO
1
Is the tape correctly positioned in the bins ?
YES
NO
See par. 17.1.
Does the Capstan rotate ?
YES
NO
See par. 13.1.
Does the tape stop on the B.O.T. marker ?
YES
NO
OK
See par. 19.1.


1
Check following signals by depressing LOAD every time after having switched the machine off and on again.
REMA = 0 ?
(B.20.1.)
YES
Check : RL1-RL2-T1, for presence of +20V and motor H4.
NO
MACO = 1 ?
(B.12.3.)
YES
Replace LURE Ø A in B.20.
NO
MACON = 0 ?
(A. 09.3.)
YES
Replace NORR in B.12.
NO
Does LOTO (B.11.15.) go to 1 and remain for approx 3 secs.
YES
Replace NORR in A.09.
NO
Does LOSE (B.13.2.) pass from 0 to 1 ?
YES
Replace FLIP-FLOP in B.11.
NO
MAREN = 0 ?
(B.13.16.)
NO
See par. 18.1.
YES
COMAB = 0 ?
(B.17.1.)
NO
Check : ICRE in B.17 - S4 S5.
YES
Check : ICRE in A.29 - LOAD pushbutton.

12.2. - CIRCUIT DIAGRAM



S4 pos. with upper bin cover open.

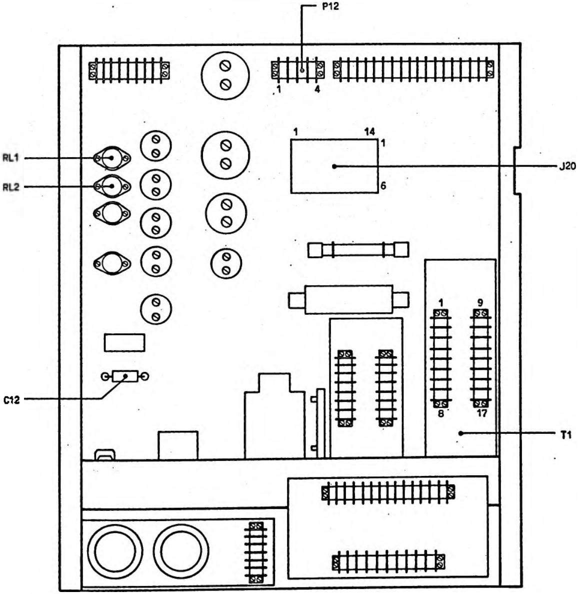
Packing position

12.3. - MACHINE DOCUMENTATION REFERENCE

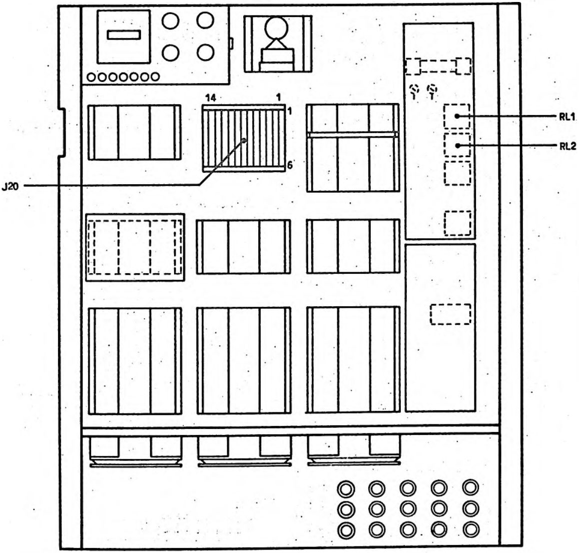
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219 - 2220)
GUN 150	14312056 (Ch. 2201 - 2205)
MUN 140	22932005
TAV 240	14033011

12.4. - COMPONENT LAYOUT

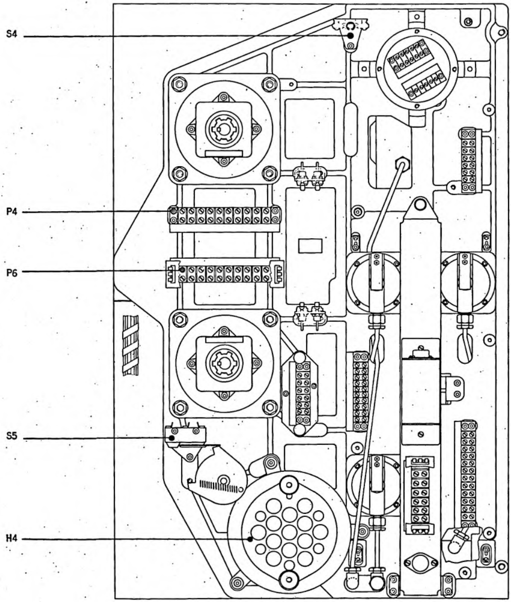
ALI 040 - Rear View



ALI 040 - Front View



MUN 140



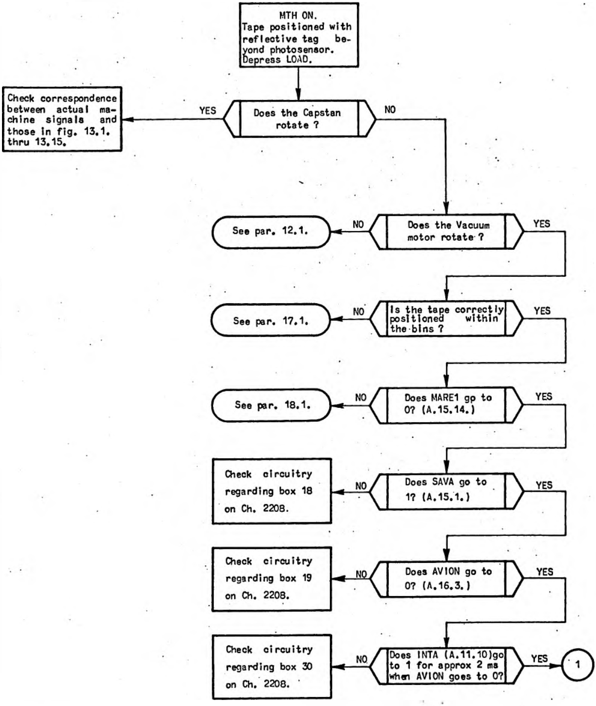
12.5. - PARTS LIST

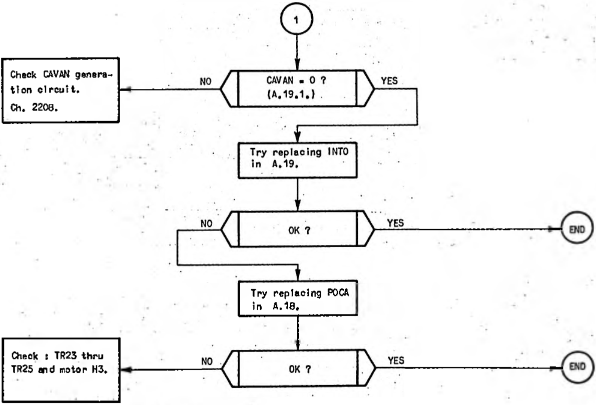
Component	Location	Logical and Electrical Functions
1	GUN 150	PWB ICRE. With pushbutton LOAD not depressed, LODAB is at "1". When the above is depressed LODAB goes to "0".
2	GUN 150	PWB ICRE - COMAB is at "1" when S4 and/or S5 open, and goes to "0" when both the switches close.
3	GUN 150	PWB NOR. By depressing LOAD, LOSE goes to "1" and returns to "0" when MAREN goes to "1", that is to say when the tape loops take up their correct position within the bin columns.
4	GUN 150	FF PWB. Sets when LOAD is depressed.
5	GUN 150	NOR PWB. MACON goes to "0" when LOTO sets. It is held at "0" by MAREN until the handler remains in Service ("Operating" status).
6	GUN 150	NOR PWB.
7	GUN 150	PWB LUREØA. When MACO is at "0" the output results +20 V. When MACO goes to "1", REMA goes to "0" enabling RL1-RL2 to be energized.
C1 - C2	MUN 140	Capacitors.
C12	ALI 040	Capacitor.
H4	MUN 140	Vacuum motor.
RL1	ALI 040	Potter relay. Energizes upon loading operations when REMA goes to "0". Its contact 11-9 brings MALE to "0".

Component	Location	Logical and Electrical Functions
RL2	ALI 040	Potter relay. Energizes upon loading operations when REMA goes to "0". Its contact 6-7 closes the vacuum motor supply circuit.
S4	MUN 140	Upper bin cover interlock switch.
S5	MUN 140	Packer arm interlock switch.
S6 (LOAD)	TAV 240	Monostable pushbutton. When depressed, brings LODAN to "0" enabling loading operations.
T1	ALI 040	Transformer. Present on taps 7-8 is a 97 VAC voltage which is derived from its primary winding.

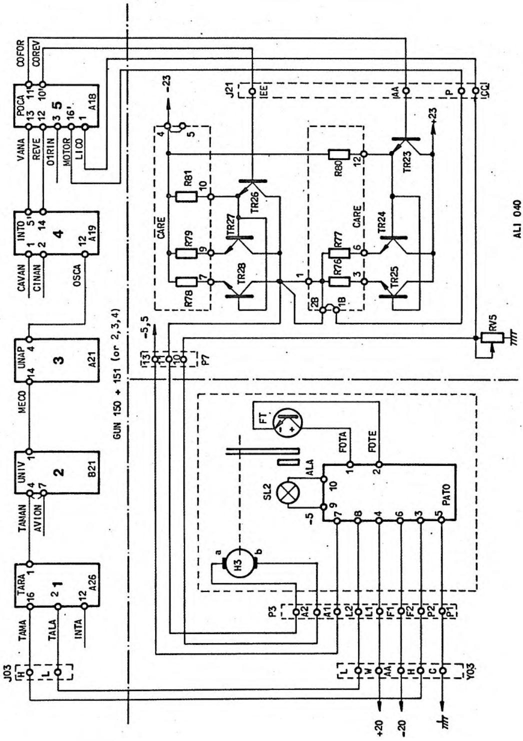
13. CAPSTAN CONTROL and SERVO-MOTOR CIRCUIT

13.1. – FLOW CHART


MTH ON.
Tape positioned with reflective tag beyond photosensor.
Depress LOAD.
Does the Capstan rotate ?
YES
NO
Check correspondence between actual machine signals and those in fig. 13.1. thru 13.15.
Does the Vacuum motor rotate ?
NO
YES
See par. 12.1.
Is the tape correctly positioned within the bins ?
NO
YES
See par. 17.1.
Does MARE1 gp to 0? (A.15.14.)
NO
YES
See par. 18.1.
Does SAVA go to 1? (A.15.1.)
NO
YES
Check circuitry regarding box 18 on Ch. 2208.
Does AVION go to 0? (A.16.3.)
NO
YES
Check circuitry regarding box 19 on Ch. 2208.
Does INTA (A.11.10)go to 1 for approx 2 ms when AVION goes to 0?
NO
YES
Check circuitry regarding box 30 on Ch. 2208.
1


1
CAVAN = 0 ?
(A.19.1.)
NO
YES
Check CAVAN generation circuit.
Ch. 2208.
Try replacing INTO in A.19.
OK ?
NO
YES
END
Try replacing POCA in A.18.
OK ?
NO
YES
END
Check : TR23 thru TR25 and motor H3.

13.2. - CIRCUIT DIAGRAM

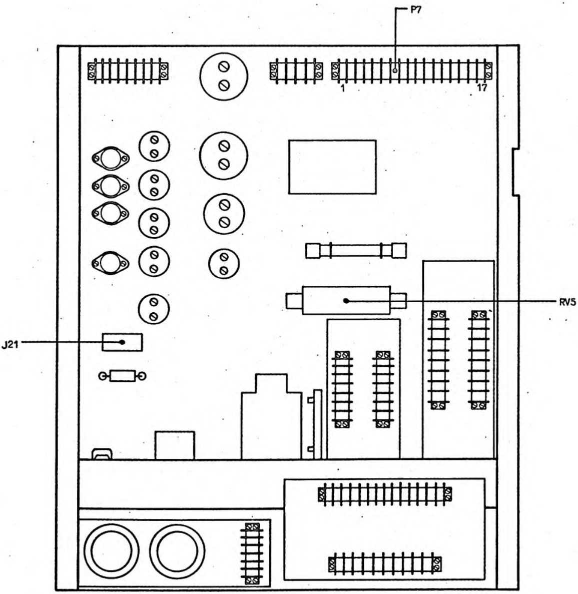


13.3. - MACHINE DOCUMENTATION REFERENCE

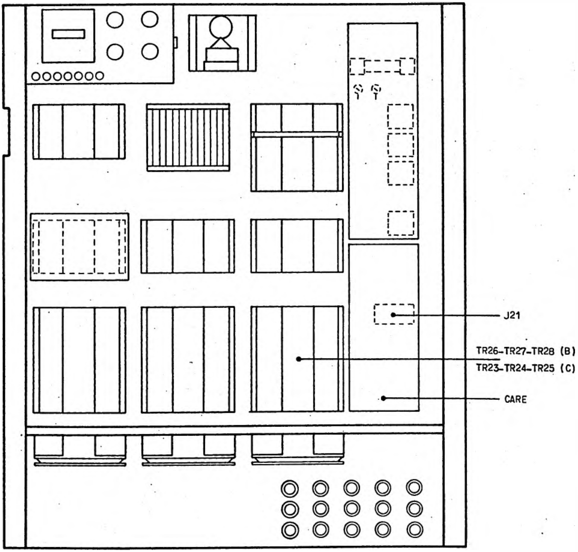
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)
ALI 040 (CARE)	14453546
GUN 150	14312056 (Ch. 2201-2208)
GUN 151	14312061 (Ch. 2213)
GUN 152	14312063 (Ch. 2213)
GUN 153	14312065 (Ch. 2213)
GUN 154	14312067 (Ch. 2213)
MUN 140	22932005

13.4. - COMPONENT LAYOUT

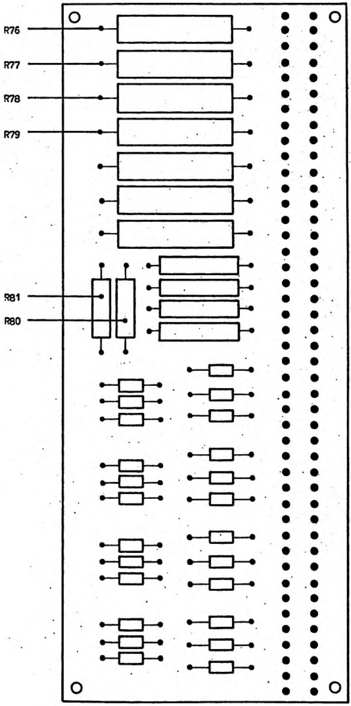
ALI 040 - Rear View



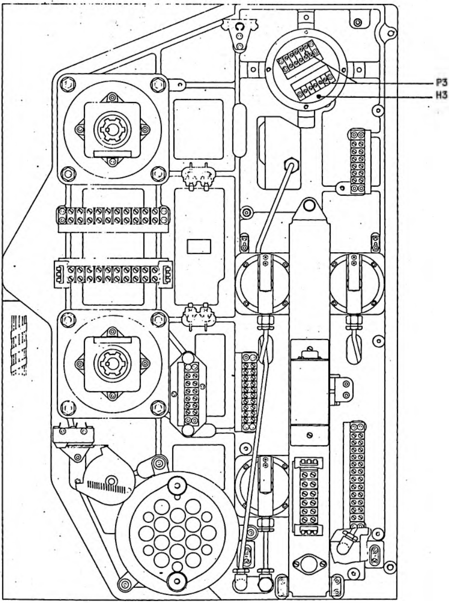
ALI 040 - Front View



ALI 040 - PWB CARE



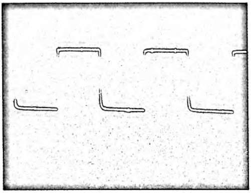
MUN 140



13.5. - PARTS LIST

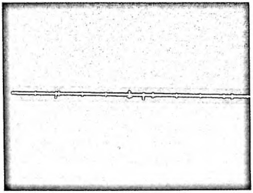
Component	Location	Logical and Electrical Functions
1	GUN 150	PWB TARA. Squares-up or amplifies signal TAMA to a standard level. When INTA is at "1" the output is inhibited. TALA is usually at "0" and only goes to "1" if the tachometer group lamp goes out.
2	GUN 150	PWB UNIV. Generates a succession of MECO clocks having a time spread proportional to the capstan speed.
3	GUN 151 (or 2,3,4)	PWB UNAP. Generates signal OSCA whose up-time is inversely proportional to the capstan speed. If the tachometer signal has a time spread that results less than UNAPs internal up-time, OSCA remains at "0".
4	GUN 151 (or 2,3,4)	PWB INTO. Generates a signal the amplitude of which results proportional to the duration of OSCA. When CAVAN is at "0", the board outputs VANA that drives the FWD mode circuits. When CINAN is at "0", the board issues REVE that drives the REV mode circuits.
5	GUN 151 (or 2,3,4)	PWB POCA. Amplifies the INTO signals. VANA generates COFOR while COREV is generated by REVE. Rewind command O1RIN, when at "0", determines a constant voltage reverse movement.
FT	MUN 140	Tachometer group phototransistor.
H3	MUN 140	Capstan motor.
PATO	MUN 140	PWB fitted on the actual capstan motor itself. Amplifies the phototransistor signal. Pins 1 and 2 are the INPUT pins while pin 3 (TAMA) is the OUTPUT pin.

Component	Location	Logical and Electrical Functions
R76	ALI 040 (CARE)	Feedback resistor on the TR25 emitter. Used to adapt the gain to TR24.
R77	ALI 040 (CARE)	Feedback resistor on the TR24 emitter. Used to adapt the gain to TR25.
R78	ALI 040 (CARE)	Feedback resistor on the TR28 emitter. Used to adapt the gain to TR27.
R79	ALI 040 (CARE)	Feedback resistor on the emitter of TR27. Used to adapt the gain to TR28.
R80 - R81	ALI 040 (CARE)	Resistors.
RV5	ALI 040	Resistor. Issues voltage LICO in turn used by the POCA current limiter circuit.
SL2	MUN 140	Tachometer group lamp.
TR23	ALI 040	Transistor. An emitter-follower that, driven by signal COFOR, controls the TR24 - TR25 amplifier.
TR24	ALI 040	Transistor. With TR25 constitutes an amplifier, the emitter resistance of which is made up from the motor winding.
TR25	ALI 040	Transistor. See TR24.
TR26	ALI 040	Transistor. An emitter-follower that, driven by signal COREV, controls the TR27 - TR28 amplifier.
TR27	ALI 040	Transistor. With TR28 constitutes an amplifier the collector resistance of which is formed by the motor winding.
TR28	ALI 040	Transistor. See TR27.



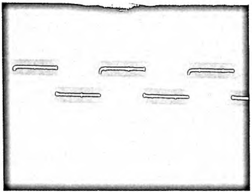
Scales : 20 μs/cm - 5 V / cm

Fig. 13.1. - A.26. 16 - TAMA



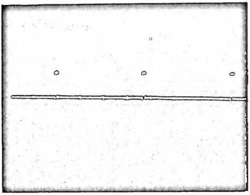
Scales : 20 μs/cm - 2 V / cm

Fig 13.2. - A.26. 12 - INTA



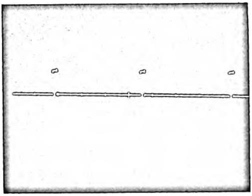
Scales : 20 μs/cm - 5 V / cm

Fig. 13.3. - A.26. 1 - TAMAN



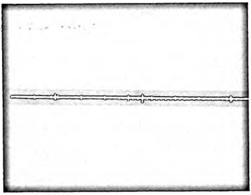
Scales : 20 µs/cm -5 V / cm

Fig. 13.4. – B.21.1. – MECO



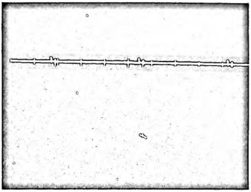
Scales : 20 µs/cm -5 V / cm

Fig. 13.5. – A.21.4 – OSCA



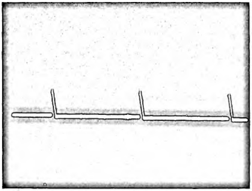
Scales : 20 µs/cm -1 V / cm

Fig. 13.6. – A.19. 1 – CAVAN



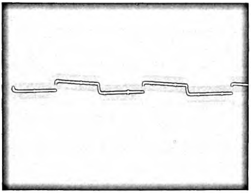
Scales : 20 µs/cm -1 V / cm

Fig. 13.7. - A.19. 2 - CINAN



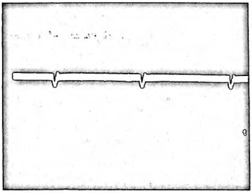
Scales : 20 µs/cm -2 V / cm

Fig. 13.8. - A.19.5' - VANA



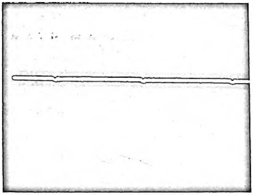
Scales : 20 µs/cm -2 V / cm

Fig. 13.9. - A.19.14 - REVE



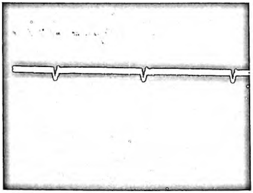
Scales : 20 us/cm -5 V / cm

Fig. 13.10. – A.18.16' – MOTOR



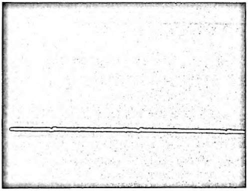
Scales : 20 us/cm -2 V / cm

Fig. 13.11. – A.18.1. – LICO



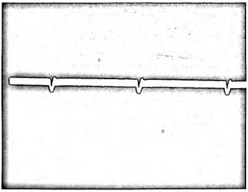
Scales : 20 us/cm -5 V / cm

Fig. 13.12. – A.18.11' – COFOR



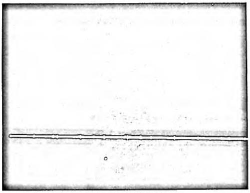
Scales : 20 us/cm -10 V / cm

Fig. 13.13. – A.18.10' – COREV



Scales : 20 us/cm -5 V / cm

Fig. 13.14. – CARE pin 3 or 6 or 12

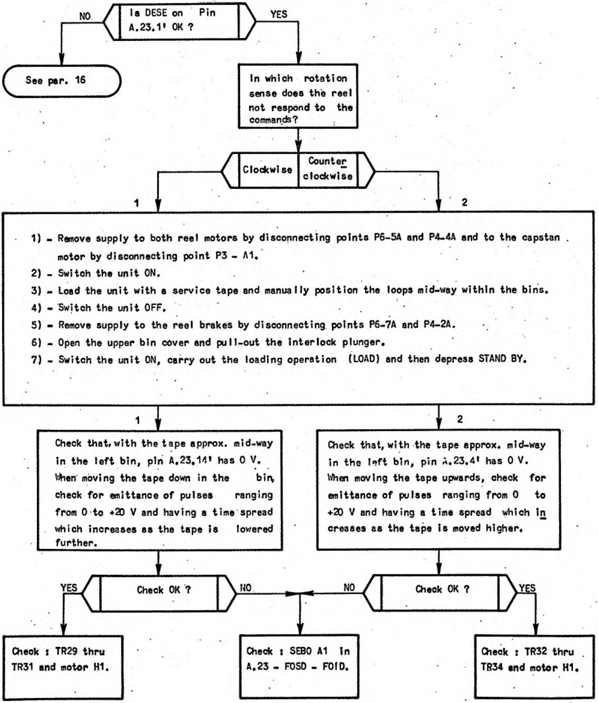


Scales : 20 us/cm -10 V / cm

Fig. 13.15. – CARE Pin 7 or 9 or 10

14. MACHINE REEL SERVO and CONTROL CIRCUIT

14.1. - FLOW CHART



Is DESE on Pin A.23.1' OK ?

See par. 16

In which rotation sense does the reel not respond to the commands?

1) - Remove supply to both reel motors by disconnecting points P6-5A and P4-4A and to the capstan motor by disconnecting point P3 - A1.
2) - Switch the unit ON.
3) - Load the unit with a service tape and manually position the loops mid-way within the bins.
4) - Switch the unit OFF.
5) - Remove supply to the reel brakes by disconnecting points P6-7A and P4-2A.
6) - Open the upper bin cover and pull-out the interlock plunger.
7) - Switch the unit ON, carry out the loading operation (LOAD) and then depress STAND BY.

Check that, with the tape approx. mid-way in the left bin, pin A.23.14' has 0 V. When moving the tape down in the bin, check for emittance of pulses ranging from 0 to +20 V and having a time spread which increases as the tape is lowered further.

Check that, with the tape approx. mid-way in the left bin, pin A.23.4' has 0 V. When moving the tape upwards, check for emittance of pulses ranging from 0 to +20 V and having a time spread which increases as the tape is moved higher.

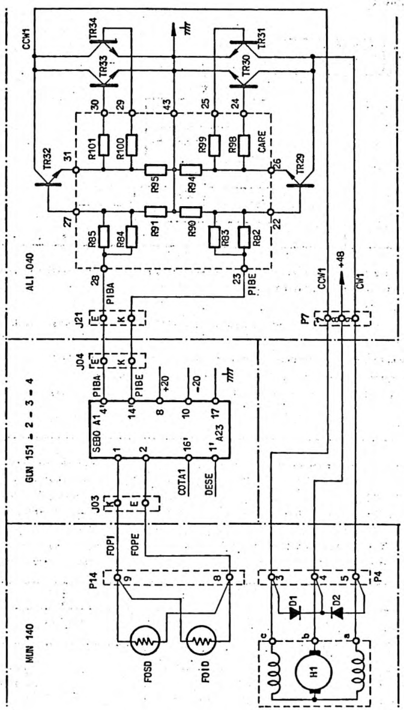
Check OK ?

Check : TR29 thru TR31 and motor H1.

Check : SEBO A1 in A.23 - FOSD - FOID.

Check : TR32 thru TR34 and motor H1.

14.2. - CIRCUIT DIAGRAM

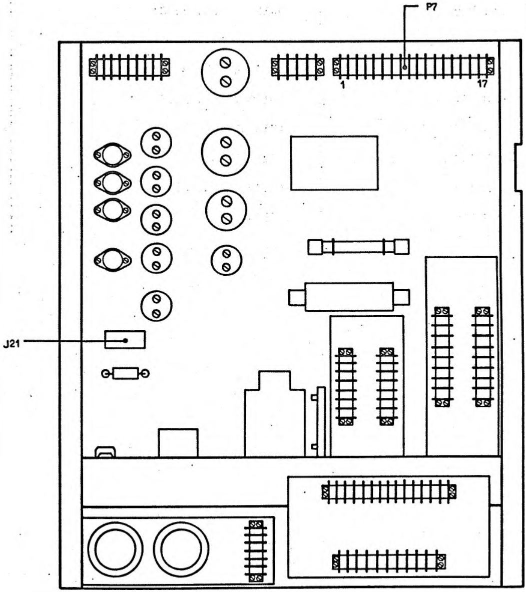


14.3. - MACHINE DOCUMENTATION REFERENCE

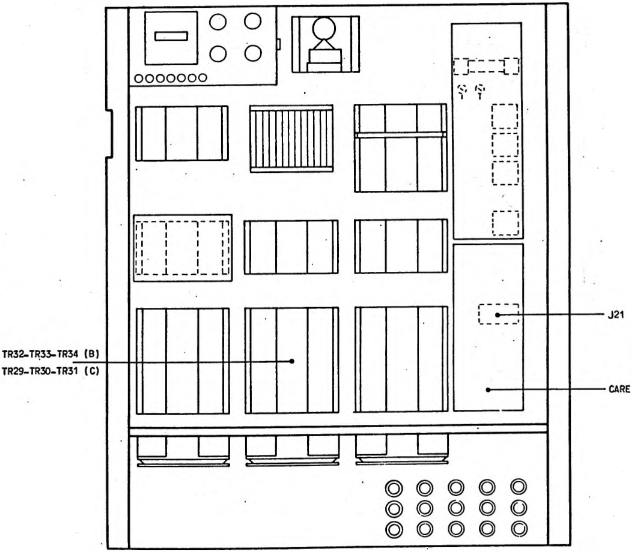
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)
ALI 040 (CARE)	14453546
GUN 150	14312056 (Ch. 2201)
GUN 151	14312061 (Ch. 2213)
GUN 152	14312063 (Ch. 2213)
GUN 153	14312065 (Ch. 2213)
GUN 154	14312067 (Ch. 2213)
MUN 140	22932005

14.4. - COMPONENT LAYOUT

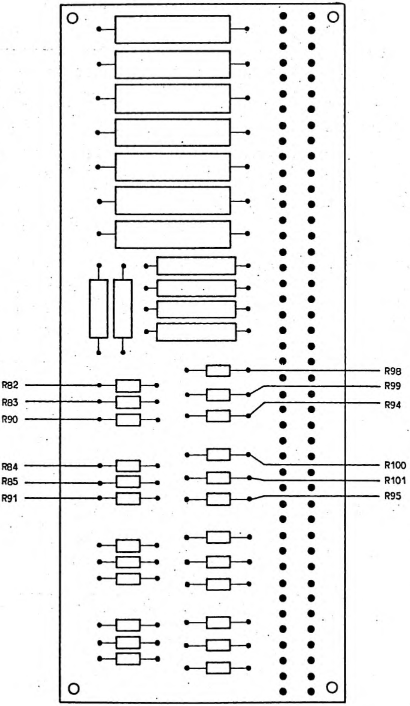
ALI 040 - Rear View



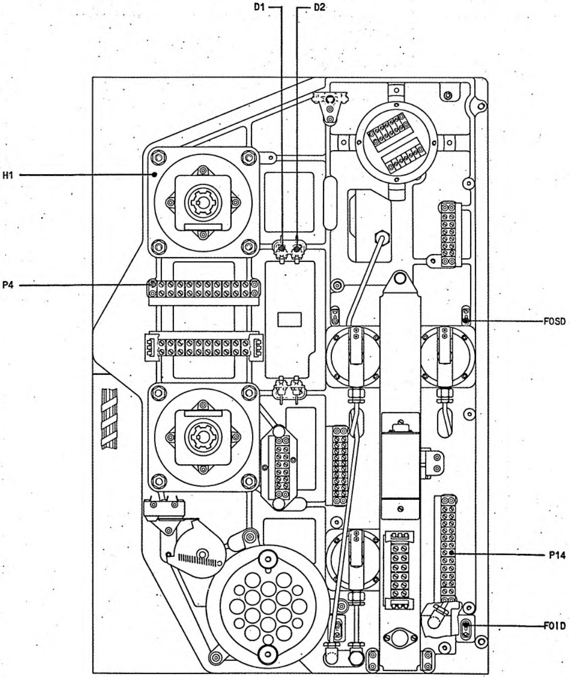
ALI 040 - Front View



ALI 040 - PWB CARE



MUN 140



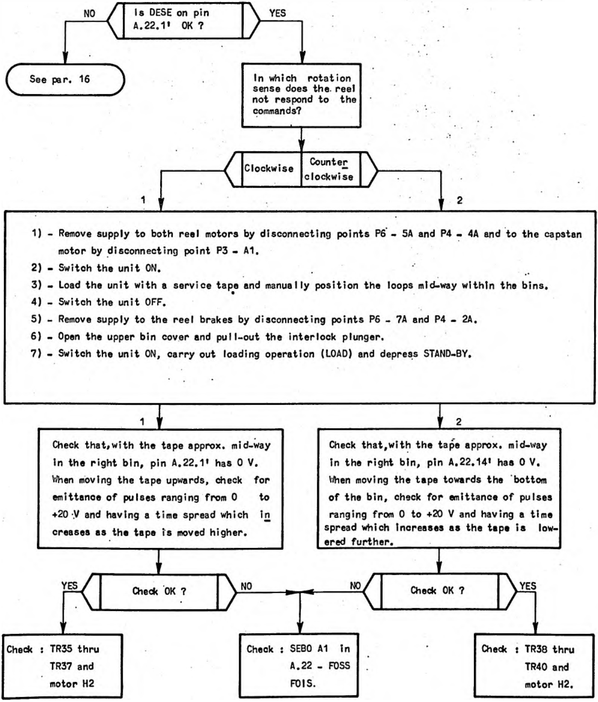
14.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
D1 - D2	MUN 140	Diodes.
FOID and FOSD	MUN 140	Photoresistors.
H1	MUN 140	Upper reel motor.
R82 thru R85	ALI 040 (CARE)	Resistors.
R90 - R91	ALI 040 (CARE)	Resistors.
R94 - R95	ALI 040 (CARE)	Resistors.
R98	ALI 040 (CARE)	Feedback resistor fitted on the base of TR30. Used to adapt the gain to TR31.
R99	ALI 040 (CARE)	Feedback resistor fitted on the base of TR31. Used to adapt the gain to TR30.
R100	ALI 040 (CARE)	Feedback resistor fitted on the base of TR34. Used to adapt the gain to TR33.
R101	ALI 040 (CARE)	Feedback resistor fitted on the base of TR33. Used to adapt the gain to TR34.
SEBOA1	GUN 151 (or 2,3,4)	Preamplifier PWB. Enabled with signal COTA1 upon loading operations. The board output signals are PIBE (CW rotation) and PIBA (CCW rotation). Signal DESE establishes the duration of the command pulses.
TR29	ALI 040	Transistor. An emitter-follower driven by signal PIBE.

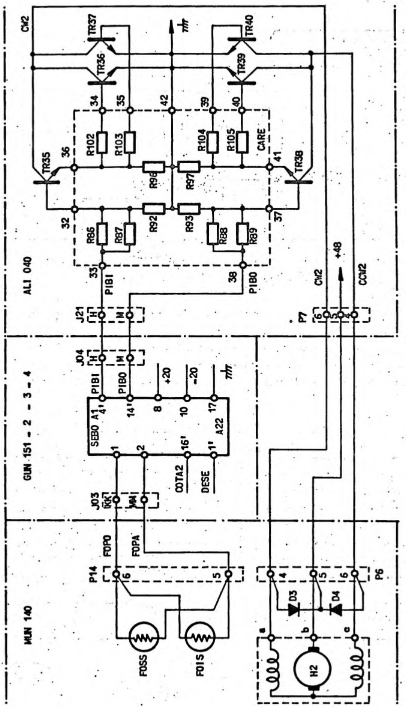
Component	Location	Logical and Electrical Functions
TR30	ALI 040	Transistor. With TR31 constitutes an inverter the collector resistance of which is formed by the CW field winding and motor rotor winding.
TR31	ALI 040	Transistor. See TR30.
TR32	ALI 040	Transistor. An emitter-follower driven by signal PIBA.
TR33	ALI 040	Transistor. With TR34 constitutes an inverter the collector resistance of which is formed by both the CCW field winding and motor rotor winding.
TR34	ALI 040	Transistor. See TR33.

15. FILE REEL SERVO and CONTROL CIRCUIT

15.1. - FLOW CHART


Is DESE on pin A.22.1' OK ?
NO
YES
See par. 16
In which rotation sense does the reel not respond to the commands?
Clockwise
Counter-clockwise
1
2
1) - Remove supply to both reel motors by disconnecting points P6 - 5A and P4 - 4A and to the capstan motor by disconnecting point P3 - A1.
2) - Switch the unit ON.
3) - Load the unit with a service tape and manually position the loops mid-way within the bins.
4) - Switch the unit OFF.
5) - Remove supply to the reel brakes by disconnecting points P6 - 7A and P4 - 2A.
6) - Open the upper bin cover and pull-out the interlock plunger.
7) - Switch the unit ON, carry out loading operation (LOAD) and depress STAND-BY.
1
2
Check that, with the tape approx. mid-way in the right bin, pin A.22.1' has 0 V. When moving the tape upwards, check for emittance of pulses ranging from 0 to +20 V and having a time spread which increases as the tape is moved higher.
Check that, with the tape approx. mid-way in the right bin, pin A.22.14' has 0 V. When moving the tape towards the bottom of the bin, check for emittance of pulses ranging from 0 to +20 V and having a time spread which increases as the tape is lowered further.
YES
Check OK ?
NO
NO
Check OK ?
YES
Check : TR35 thru TR37 and motor H2
Check : SEBO A1 in A.22 - FOSS FOIS.
Check : TR38 thru TR40 and motor H2.

15.2. - CIRCUIT DIAGRAM

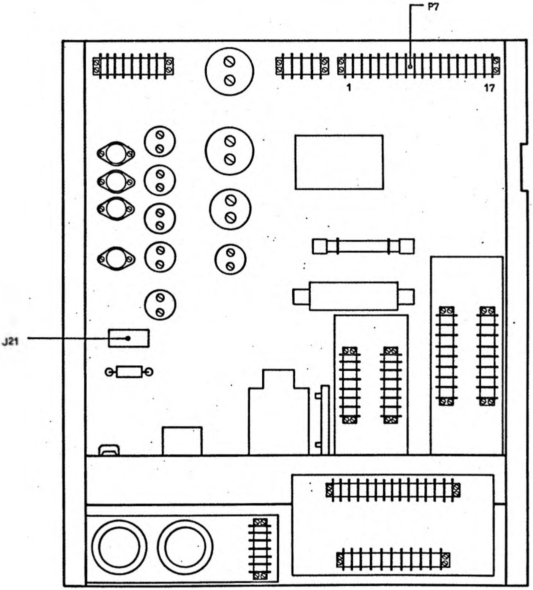


15.3. - MACHINE DOCUMENTATION REFERENCE

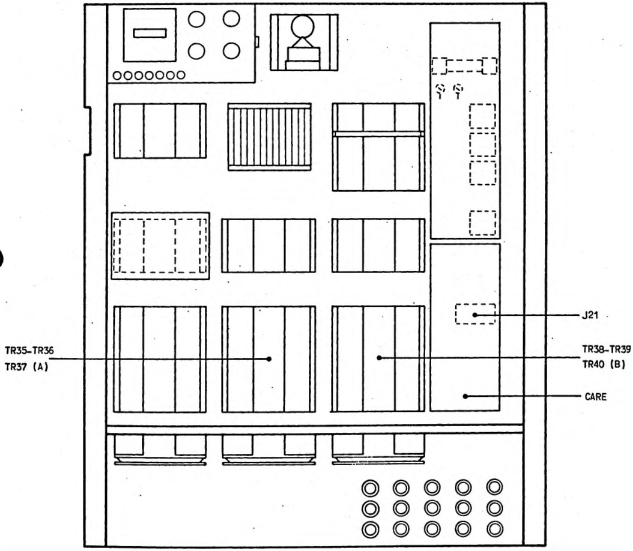
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)
ALI 040 (CARE)	14453546
GUN 150	14312056 (Ch. 2201)
GUN 151	14312061 (Ch. 2213)
GUN 152	14312063 (Ch. 2213)
GUN 153	14312065 (Ch. 2213)
GUN 154	14312067 (Ch. 2213)
MUN 140	22932005

15.4. - COMPONENT LAYOUT

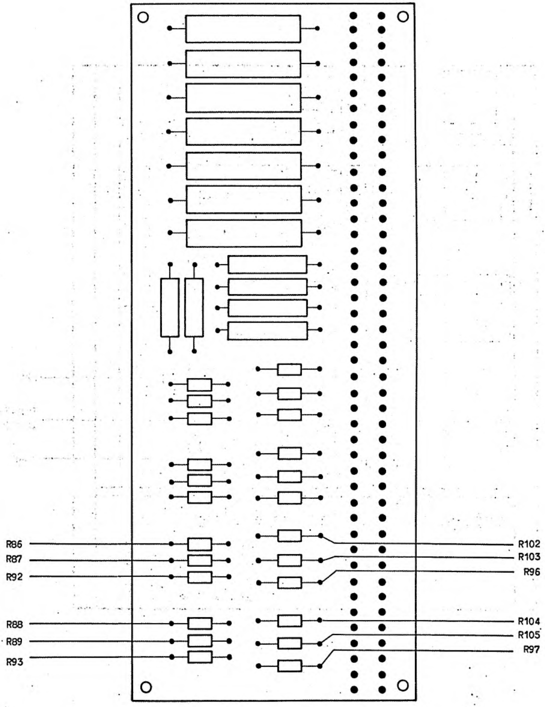
ALI 040 - Rear View



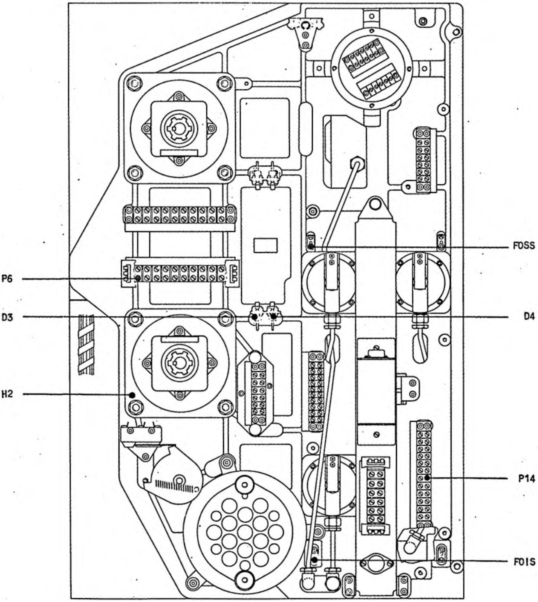
ALI 040 - Front View



ALI 040 - PWB CARE



MUN 140



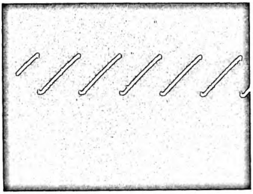
15.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
D3 - D4	MUN 140	Diodes.
FOIS and FOSS	MUN 140	Photoresistors.
H2	MUN 140	Lower reel motor.
R86 thru R89	ALI 040 (CARE)	Resistors.
R92 - R93	ALI 040 (CARE)	Resistors.
R96 - R97	ALI 040 (CARE)	Resistors.
R102	ALI 040 (CARE)	Feedback resistor on the base of TR36. Used to adapt the gain to TR37.
R103	ALI 040 (CARE)	Feedback resistor on the base of TR37. Used to adapt the gain to TR36.
R104	ALI 040 (CARE)	Feedback resistor on the base of TR40. Used to adapt the gain to TR39.
R105	ALI 040 (CARE)	Feedback resistor on the base of TR39. Used to adapt the gain to TR40.
SEBO A1	GUN 151 (or 2,3,4)	Preamplifier PWB. Enabled with signal COTA2 upon loading operations. The board output signals are PIBI (CW rotation). and PIBO (CCW rotation). Signal DESE establishes the duration of the command pulses.
TR35	ALI 040	Transistor. An emitter - follower driven by signal PIBI.
TR36	ALI 040	Transistor. With TR37 constitutes an inverter, the collector resistance of which is formed by the CW field winding and motor rotor winding.

Component	Location	Logical and Electrical Functions
TR37	ALI 040	Transistor. See TR36.
TR38	ALI 040	Transistor. An emitter-follower driven by signal PIBO.
TR39	ALI 040	Transistor. With TR40 constitutes an inverter, the collector resistance of which is formed by the CCW field winding and motor rotor winding.
TR40	ALI 040	Transistor. See TR39.

16. "DESE" SIGNAL GENERATION CIRCUIT

Check that signal DESE finds corrispondance with the waveform of fig. 16.1. otherwise, proceed to carefully check the components shown in the below illustrated circuit.

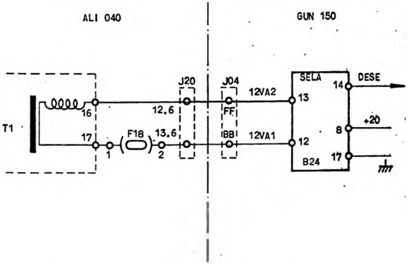


Scales : 5 ms/cm -2 V / cm

Scope sync on : INT - AUTO

Fig. 16.1. - B.24.14 - DESE

16.1. - CIRCUIT DIAGRAM

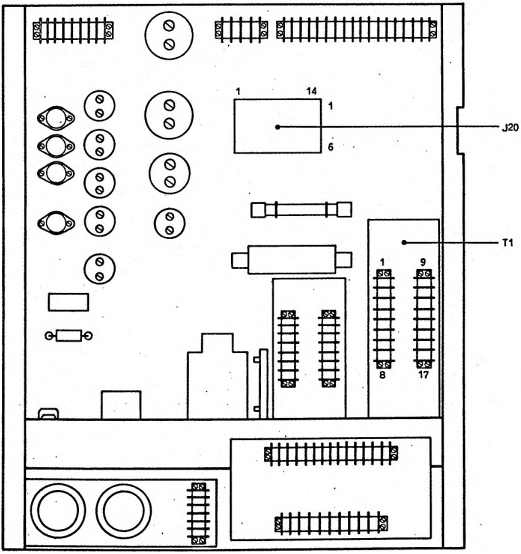


16.2. - MACHINE DOCUMENTATION REFERENCE

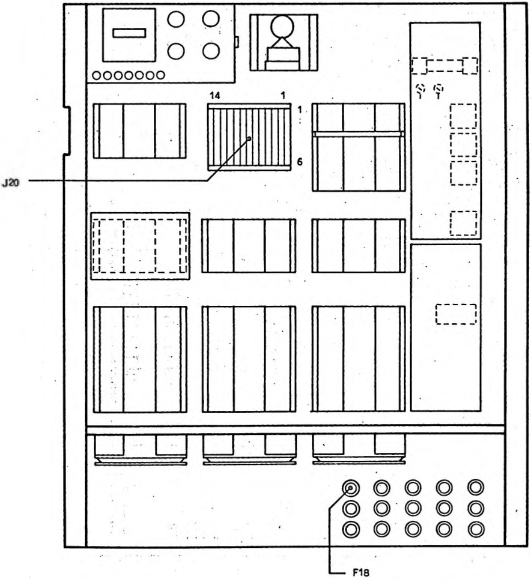
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2220)
GUN I50	14312056 (Ch. 2201 - 2208)

16.3. - COMPONENT LAYOUT

ALI 040 - Rear View



ALI 040 - Front View

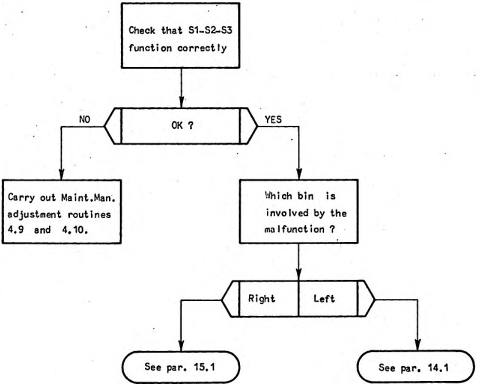


16.4. - PARTS LIST

Component	Location	Logical and Electrical Functions
F18	ALI 040	Fuse.
SELA	GUN 150	PWB. The section of the board that generates signal DESE (used by the reel motor command circuits) is supplied with 20 VAC.. Saw-tooth signal DESE level ranges from +2.5 to +4.5 V and has a frequency double that of the input and equal to 100 or 120 Hz.
T1	ALI 040	Transformer.

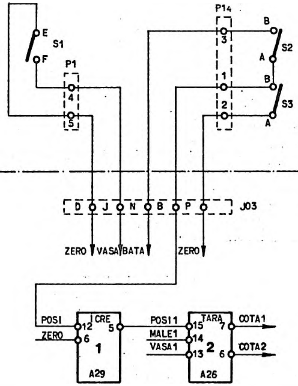
17. VACUUM PRESSURE and TAPE LOOP POSITION CONTROL CIRCUIT

17.1. - FLOW CHART


Check that S1-S2-S3 function correctly
OK ?
NO
YES
Carry out Maint.Man. adjustment routines 4.9 and 4.10.
Which bin is involved by the malfunction ?
Right
Left
See par. 15.1
See par. 14.1

17.2. - CIRCUIT DIAGRAM

Switch position in absence of vacuum pressure.



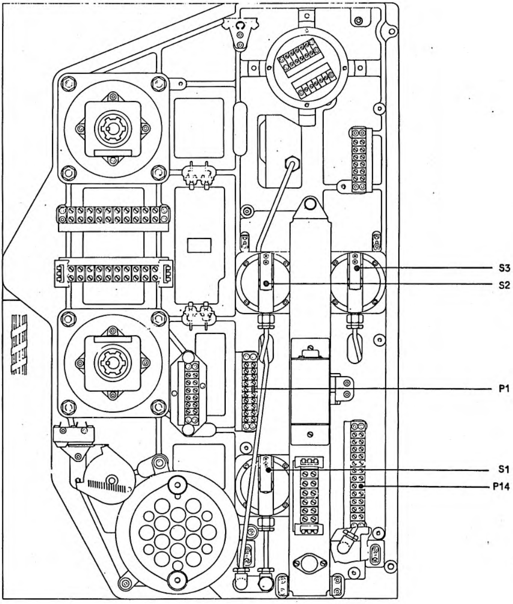
Switch position when the tape loop either goes beyond the upper or lower bin limits.

17.3. - MACHINE DOCUMENTATION REFERENCE

Elementary Unit	Drawing Number
GUN 150	14312056 (Ch. 2201-2205-2208)
MUN 140	22932005

17.4. - COMPONENT LAYOUT

MUN 140

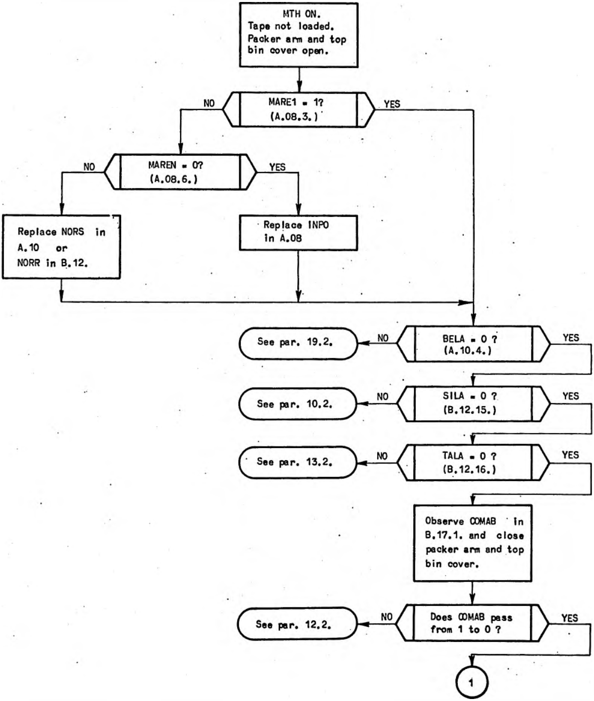


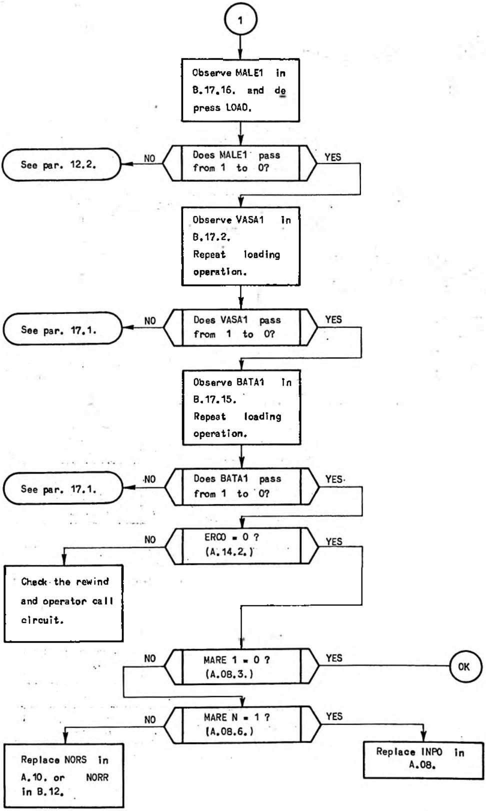
17.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
1	GUN 150	PWB ICRE. When interlock switch S3 is open, POSI1 is at "1", when S3 closes, POSI1 goes to "0".
2	GUN 150	PWB TARA. Generates both signals COTA1 and COTA2 which, when at "1", enable both the machine and file reel command circuits respectively. With both MALE1 and VASA1 at "0", COTA1 is at "1". COTA2 is at "1" when POSI1, MALE1 and VASA1 are at "0".
S1	MUN 140	Pneumatic reference switch. Operates when bin vacuum pressure reaches 70% of its nominal value.
S2	MUN 140	Out of Service pneumatic interlock switch fitted on left hand column (as seen from rear). Usually the contact is made and only breaks when the tape loop goes beyond either the upper or lower limit sensors.
S3	MUN 140	Out of Service pneumatic interlock switch fitted on the right hand column (as seen from rear). The contact is usually made, under normal conditions, and only breaks when the tape loop goes beyond the upper or lower limit sensors.

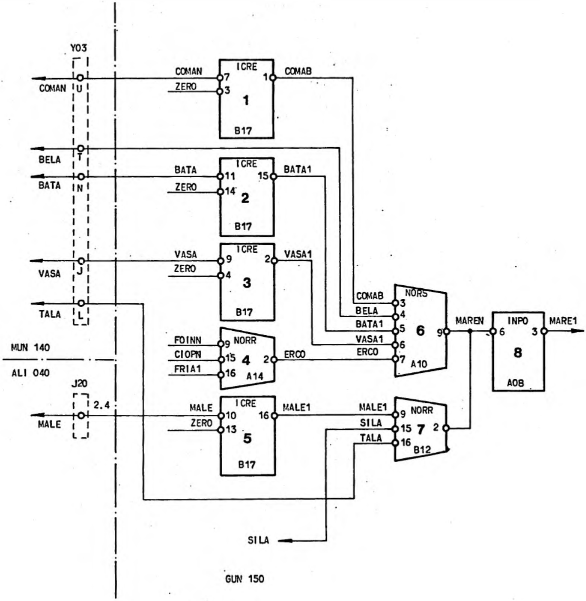
18. "MARE" SIGNAL GENERATION CIRCUIT

18.1. - FLOW CHART




1
Observe MALE1 in B.17.16. and depress LOAD.
Does MALE1 pass from 1 to 0?
NO
See par. 12.2.
YES
Observe VASA1 in B.17.2. Repeat loading operation.
Does VASA1 pass from 1 to 0?
NO
See par. 17.1.
YES
Observe BATA1 in B.17.15. Repeat loading operation.
Does BATA1 pass from 1 to 0?
NO
See par. 17.1.
YES
ERCO = 0 ? (A.14.2.)
NO
Check the rewind and operator call circuit.
YES
MARE 1 = 0 ? (A.08.3.)
YES
OK
NO
MARE N = 1 ? (A.08.6.)
NO
Replace NORS in A.10. or NORR in B.12.
YES
Replace INPO in A.08.

18.2. - CIRCUIT DIAGRAM

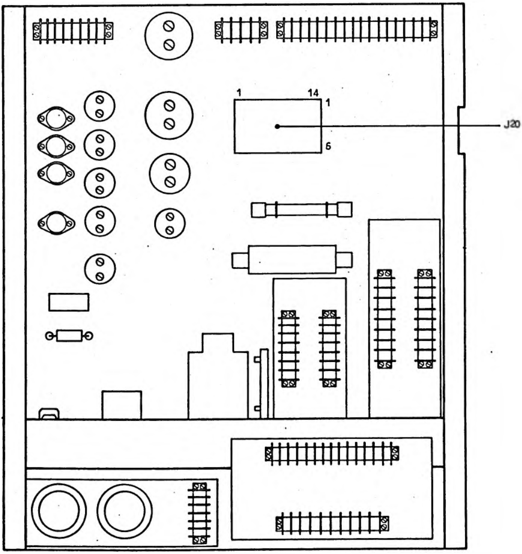


18.3. - MACHINE DOCUMENTATION REFERENCE

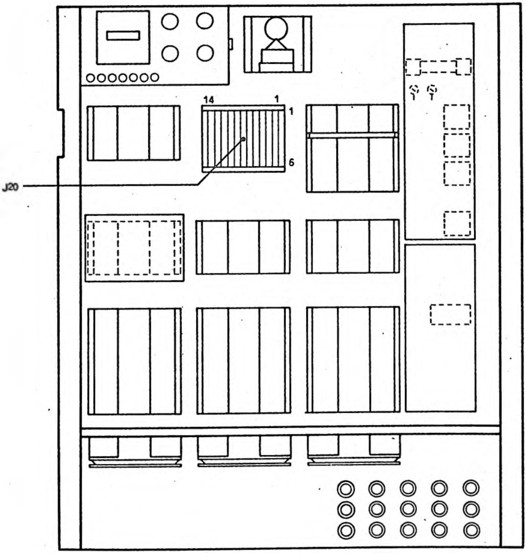
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
GUN 150	14312056 (Ch. 2201-2205-2206)
MUN 140	22932005

18.4. - COMPONENT LAYOUT

ALI 040 - Rear View



ALI 040 - Front View



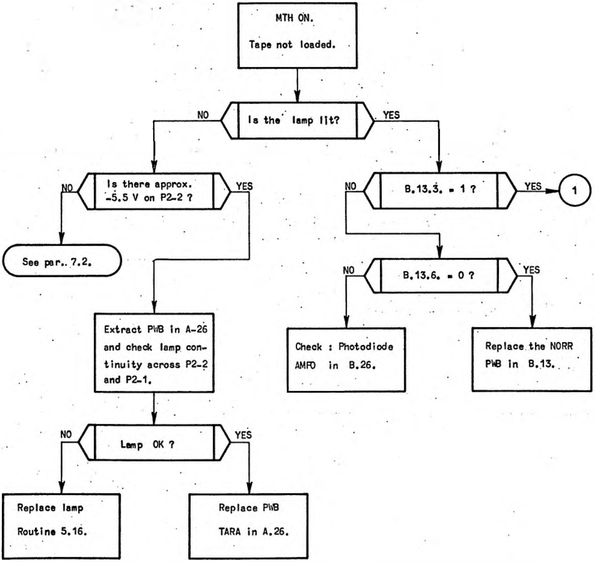
18.5. - PARTS LIST

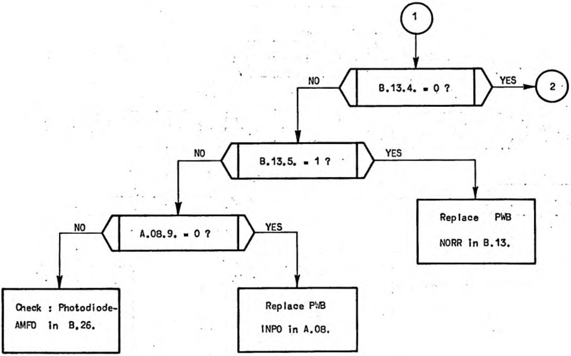
Component	Location	Logical and Electrical Functions
1	GUN 150	PWB ICRE. COMAB is at "1" when the upper bin cover and/or the packer arm interlock switches open. When both these close, COMAB goes to "0".
2	GUN 150	PWB ICRE. When the tape goes either too high or too low within the bin,BATA1 goes to"1".Under normal conditions BATA1 is at "0".
3	GUN 150	PWB ICRE. When the pneumatic interlock switch opens (insufficient vacuum pressure) VASA1, normally at "0", goes to "1".
4	GUN 150	NOR PWB. When in "Rewind and Unload" and the BOT marker is under the photosensors, ERCO goes to "1".
5	GUN 150	PWB ICRE. When RL1 de-energizes MALE1, which is normally at "0", goes to "1".
6	GUN 150	NOR PWB. With component 7, generates MAREN which under normal conditions is at "1". Also fed to the board input,apart from signals coming from components 1, 2, 3 and 4, is signal BELA. BELA is normally at "0" and only goes to "1" if the photosensor lamp should go out.

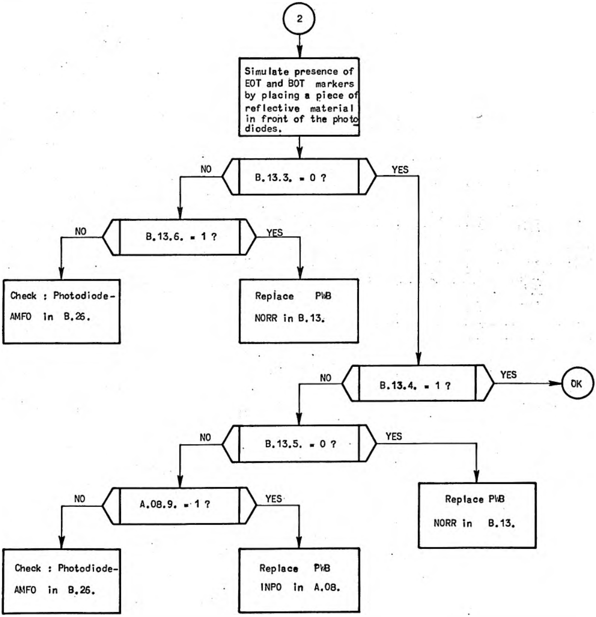
Component	Location	Logical and Electrical Functions
7	GUN 150	NOR PWB. With component 6 generates MAREN which under normal conditions is at "1". Also fed to its input, apart from the signal from component 5, is signal SILA and TALA. SILA goes to "1" if the fluorescent lamp goes out or looses its brightness while TALA goes to "1" if the tachometer lamp should fail.
8	GUN 150	PWB INPO. Under normal conditions, MARE1 is at "0" and goes to "1" if the handler goes in the Out of Service status.

19. BOT and EOT PHOTOSENSING CIRCUITS

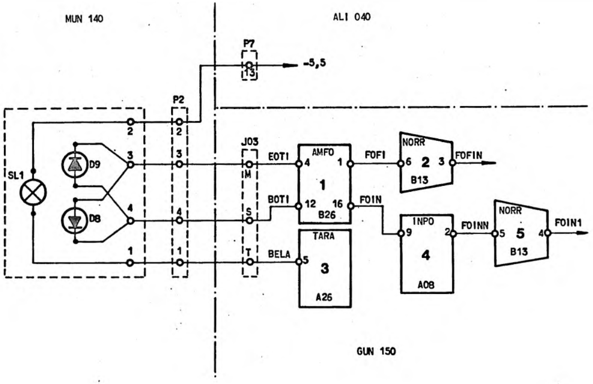
19.1. - FLOW CHART


MTH ON.
Tape not loaded.
Is the lamp lit?
NO
YES
Is there approx. -5.5 V on P2-2 ?
NO
YES
See par. 7.2.
Extract PWB in A-26 and check lamp continuity across P2-2 and P2-1.
Lamp OK ?
NO
YES
Replace lamp Routine 5.16.
Replace PWB TARA in A.26.
B.13.3. = 1 ?
NO
YES
1
B.13.6. = 0 ?
NO
YES
Check : Photodiode AMFO in B.26.
Replace the NORR PWB in B.13.


1
B.13.4. = 0 ?
YES
2
NO
B.13.5. = 1 ?
YES
Replace PWB NORR in B.13.
NO
A.08.9. = 0 ?
YES
Replace PWB INPO in A.08.
NO
Check : Photodiode-AMFO in B.26.


2
Simulate presence of EOT and BOT markers by placing a piece of reflective material in front of the photodiodes.
B.13.3. = 0 ?
NO
YES
B.13.6. = 1 ?
NO
YES
Check : Photodiode-AMFO in B.26.
Replace PWB NORR in B.13.
B.13.4. = 1 ?
NO
YES
OK
B.13.5. = 0 ?
NO
YES
Replace PWB NORR in B.13.
A.08.9. = 1 ?
NO
YES
Check : Photodiode-AMFO in B.26.
Replace PWB INPO in A.08.

19.2. - CIRCUIT DIAGRAM

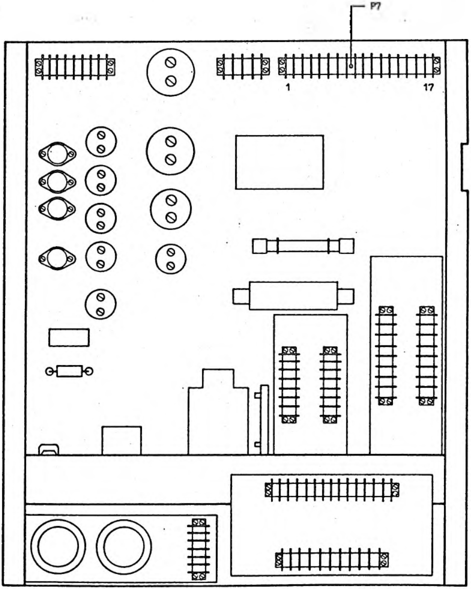


19.3. - MACHINE DOCUMENTATION REFERENCE

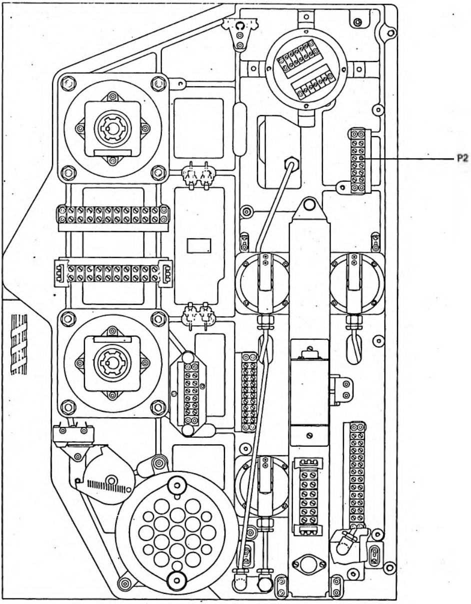
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2221)
GUN 150	14312056 (Ch. 2201-2205-2208)
MUN 140	22932005

19.4. - COMPONENT LAYOUT

ALI 040 - Rear View



MUN 140



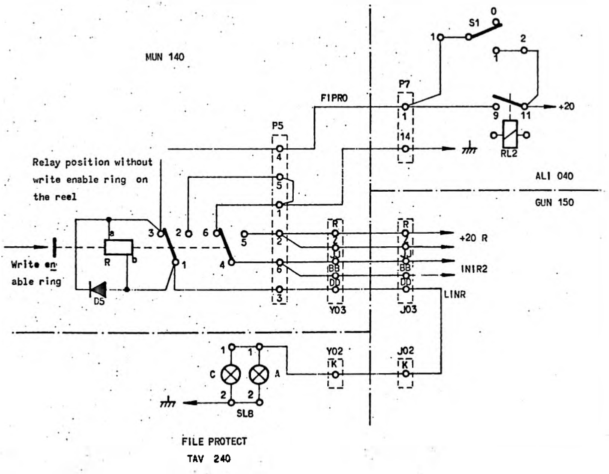
19.5. - PARTS LIST

Component	Location	Logical and Electrical Functions
1	GUN 150	PWB AMFO. When EOT marker is present, FOFI goes to "1" while FOIN goes to "1" with the BOT marker.
2	GUN 150	NOR PWB. When EOT marker is present FOFIN is at "0".
3	GUN 150	PWB TARA. If the lamp functions properly, BELA is at "0". When the lamp fails, BELA goes to "1" giving way to MARE.
4	GUN 150	PWB INPO. When BOT marker is present FOINN is at "0".
5	GUN 150	NOR PWB. When BOT marker is present FOIN1 is at "1".
D8 - D9	MUN 140	Photodiodes.
SL1	MUN 140	BOT and EOT sensor lamp.

20. WRITE INHIBIT CIRCUIT

In case of any malfunctions, check Maint. Manual adjustment routine 4.5. and eventually the below illustrated circuit components.

20.1. - CIRCUIT DIAGRAM

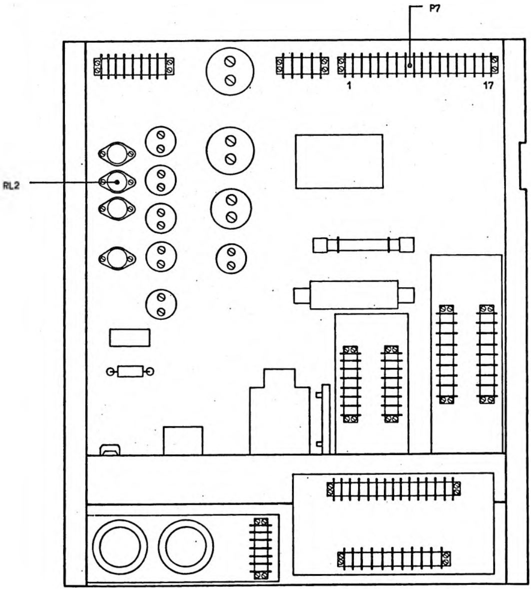


20.2. - MACHINE DOCUMENTATION REFERENCE

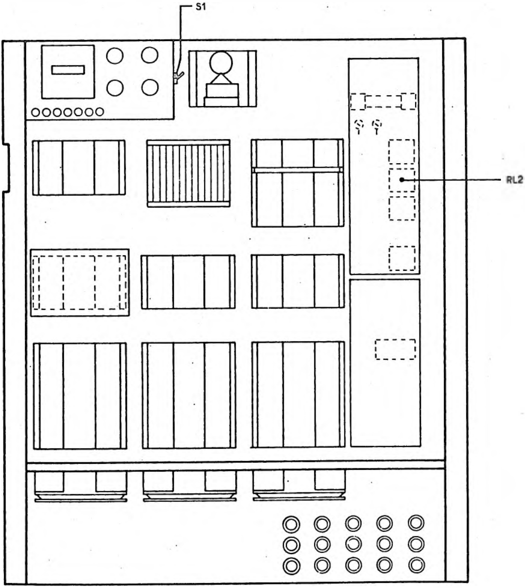
Elementary Unit	Drawing Number
ALI 040	14432940 (Ch. 2219)
GUN 150	14312056 (Ch. 2201)
MUN 140	22932005
TAV 240	14033011

20.3. - COMPONENT LAYOUT

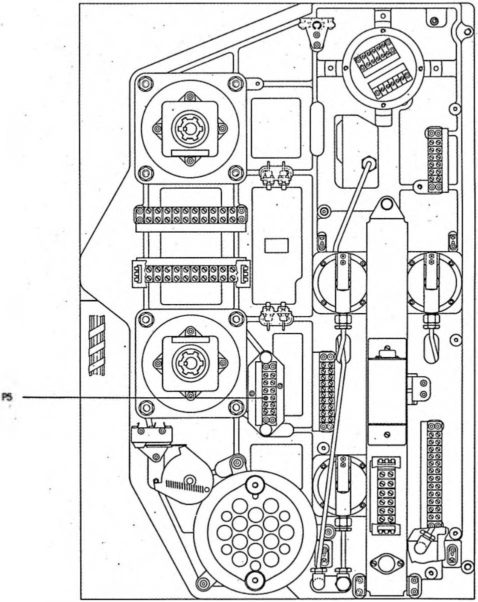
ALI 040 - Rear View



ALI 040 - Front View



MUN 140



N.B. - Both relay R and diode D5 are physically located under terminal strip P5.

20.4. - PARTS LIST

Component	Location	Logical and Electrical Functions
D5	MUN 140	Diode.
R	MUN 140	Write inhibit relay. When the write enable ring is fitted on the file reel it energizes this relay. The relay is held-on through contact 1-2, bringing INIR2 to +20 through contact 4-5 and LINR to "0" through contact 1-2. If the write enable ring is not inserted, INIR2 is at "0" and LINR goes to +20 V.
RL2	ALI 040	Potter relay. Energizes upon loading operations. It is held-on until the handler goes in the Out of Service status.
S1	ALI 040	Manually operable switch that shunts RL2 contact 9-11 during maintenance operations.
SL8	TAV 240	FILE PROTECT indicator lamps. When lit, indicate that the recording is inhibited.

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PREVENTIVE MAINT. LOG

MTH 101-103/B
111-117/B
163 to 172

YEAR MACHINE TYPE and SERIAL N°

MAINTENANCE TYPE **G**		
Approx. duration 0,25 h.h/10		
FREQ.	3 months	6 months
SHIFTS	2-3	1

SCHED. DATE	EFFECT. DATE	EFFECT. DURAT.	ENGR.

PARTS		REPL. FREQ. (hours)	SCHEDULED REPLACEMENTS					
Vacuum Motor Filter	0687056 V	700						
Vacuum Motor Brushes	706168 T	1,400						

DATE	NOTES

Mod. 0146

MAINTENANCE SCHEDULE TYPE G

MACHINE OFF OPERATIONS

1. CLEANING

a- Read the notes on the Preventive Maintenance Log.

b- Check that the operator has cleaned : (1.1.)
- the magnetic head and pertinent rollers
- capstan surface
- vacuum bins
- main casting
- packing arm and sliding window

2. SCHEDULED REPLACEMENTS

In accordance with the Preventive Maintenance log and subsystem clapsed time counter, check and replace :

ONLY FOR COLLECTOR TYPE VACUUM MOTORS

a- vacuum motor brushes	(5.21)
b- vacuum motor filter	(5.22)

3. FINAL OPERATIONS

a- Fill in the Preventive Maintenance Log.

Note

Reference numbers, in brackets, refer to the MTH 163 to 172 and MTH 101 - 103/B - 111 - 117/B Maintenance Manuals P.N. 4.809.4.000 and 4.808.4.000 respectively.

The pertinent Preventive Maintenance Log. has P.N. 4.033.4.074.

PARTS

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SOTTOSISTEMA

MTH 101-103B-111-117B-163-166-172

MTC 101-101B-103B-114B-163-164-166-167-172-173

Catalogo parti di ricambio

TERZA EDIZIONE

Edito a cura della
Sezione Assistenza Tecnica

4.808.5.001.2

LIVELLO DI EVOLUZIONE

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	I Edizione – Frontispizio codice nº 4.808.5.001.0	Agosto 1968
	II Edizione – Frontispizio codice nº 4.808.5.001.1	Luglio 1969
	III Edizione – Frontispizio codice nº 4.808.5.001.2	Marzo 1971

Mod. 0751

N.B. I numeri barrati indicano che le pagine relative devono essere eliminate

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SOTTOSISTEMA

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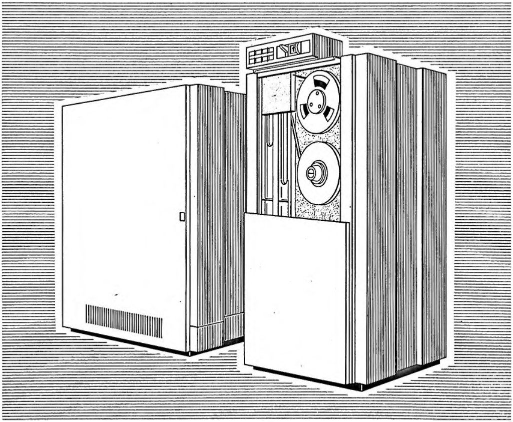

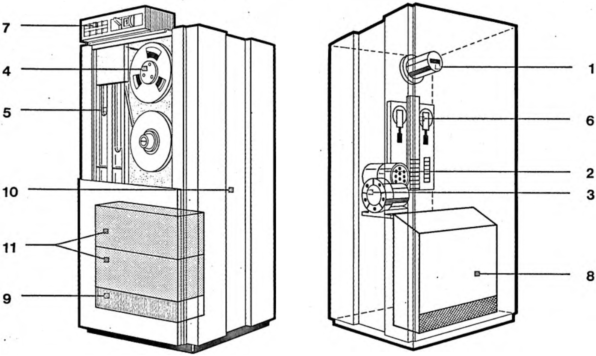

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3	Motore aspiratore (SIEMENS)	12 - 13
4	Motori bobine	14 ÷ 17
5	Testina e parte anteriore	18 ÷ 21
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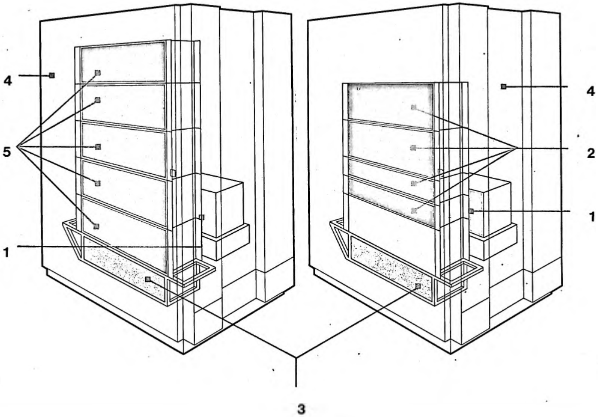
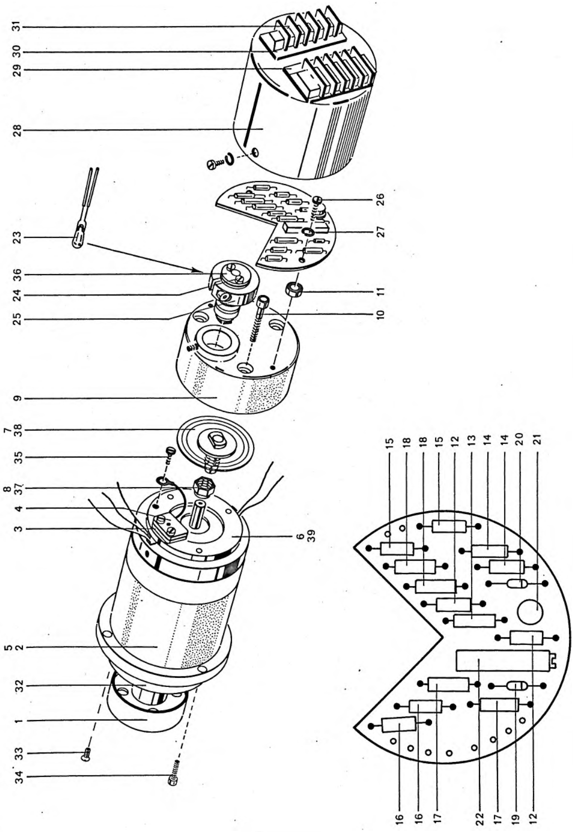
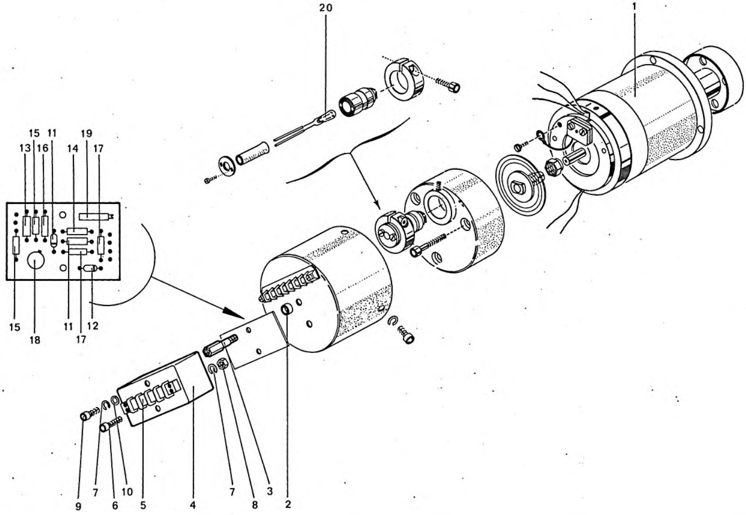


Rif.	Descrizione	Pagina
1	Distribuzione alternata (ALI 260)	64 ÷ 67
2	Telaio elettronica (GUN 500) e piastrine	68 ÷ 71
3	Ventilatore (VAR 332 A/L)	72 - 73
4	Mobile (CON 330)	74 - 75
5	Elenco piastrine GUN 170 ÷ 179	76 - 77

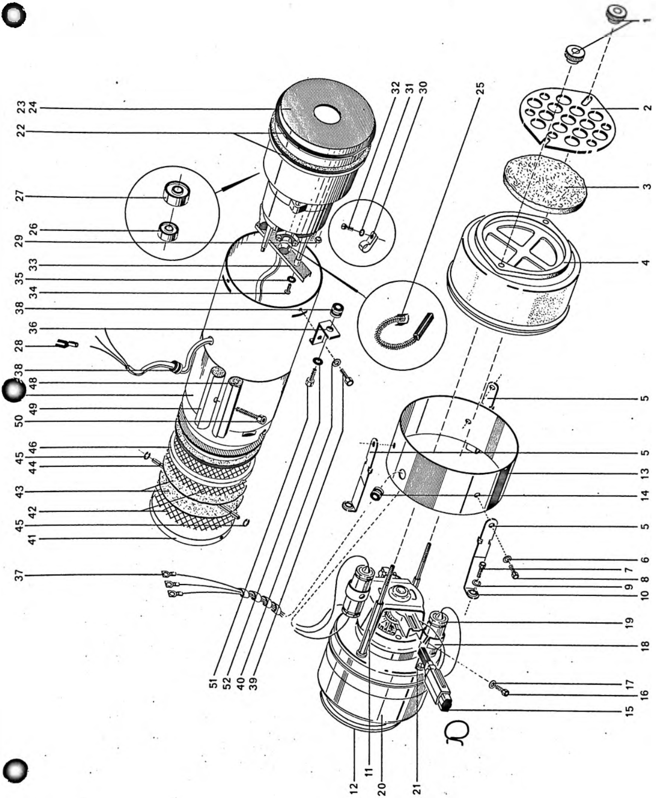
1	0687063 Z	Gruppo Capstan
2	5523235 T	Motore Autline (mot. GE)
-	0687390 Q	AG. Motore CEM
-	0687325 B	AG. Motore GE
3	0687336 Q	Piastrina isolante
4	0687332 P	Gruppo montaggio fototransistor
5	5523237 B	Motore
6	0687394 N	Flangia tachimetro
7	0687391 R	Gruppo fotodisco
8	0687393 Z	Dado tachimetro
9	0687335 C	Calotta tachimetro
10	6313119 X	Vite TCE 4MAx20
11	0687339 D	Distanziale
-	0687344 E	AP. Piastrina PATO
12	4933846 T	Resistenza 680
13	4927050 W	Resistenza 1 M
14	4934684 X	Resistenza 4,7 K
15	4934287 T	Resistenza 1,8 K
16	4932047 B	Resistenza 10
17	5037500 R	Cond. 15 µF
18	5006845 F	Cond. 0,022 µF
19	0001948 X	Diodo 1S 2120/A
20	5824762 X	Diodo 1S 2062/A
21	5882310 S	Amplif. integrato
22	0001133 F	Potenziometro
23	0001950 W	Lampada
24	6313050 F	Vite 2MAx5
25	0687337 L	Anello taratura lamp.
26	6311231 R	Vite 3Mx8
27	9940340 K	Rondella piana ø 3,2
28	0687396 W	Calotta
29	0687397 S	Targhetta A1 ÷ F2
30	0687396 P	Targhetta L1 ÷ GND
31	5612552 K	Morsettiera Rhodex
32	0687400 V	Calotta morsetti
33	7454736 P	Vite TCS 3x17
34	6313120 V	Vite TCE 4MAx25
35	6311230 Q	Vite TC 3x6
36	0687341 C	Flangia blocca lampada
37	0687340 B	Dado tachimetro (mot. GE)
38	0687348 A	Gruppo fotodisco (mot. GE)
39	0687338 H	Flangia tachimetro (mot. GE)



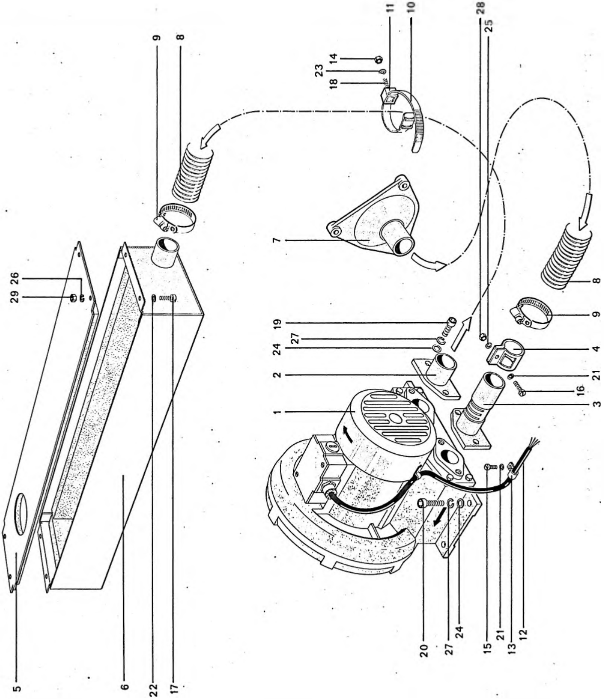
–	0687455 Q	AG. Motore capstan (per U.N. 75"/sec)
1	5523240 S	Motore capstan
2	0687451 P	Distanziale
3	0687453 X	Colonnina
4	0687454 L	Protezione piastrina
5	0001469 A	Morsettiera 4 poz.
6	6313116 A	Vite T.C.C.E. M4x12
7	6332104 B	Rondella elastica ∅ 4,3
8	6321104 W	Dado M4
9	6313114 S	Vite T.C.C.E. 4x8
10	6331104 X	Rondella piana ∅ 4,3
–	0620144 M	AP. Piastrina PRET
11	0001948 X	Diodo 1S 2120/A
12	5826832 X	Diodo 1S 2068/A
13	5006845 F	Cond. 0,022 µF 200V
14	5037500 R	Cond. 15 µF 20V
15	4934684 X	Resist. 4,7 KOhm $\frac{1}{2}$ W
16	4927050 W	Resist. 1 M Ohm 1/4 W
17	4933246 T	Resist. 680 Ohm $\frac{1}{2}$ W
18	5882310 S	Circuito integrato
19	4991520 S	Potenziometro 20 KOhm
20	4369744 M	Lampada



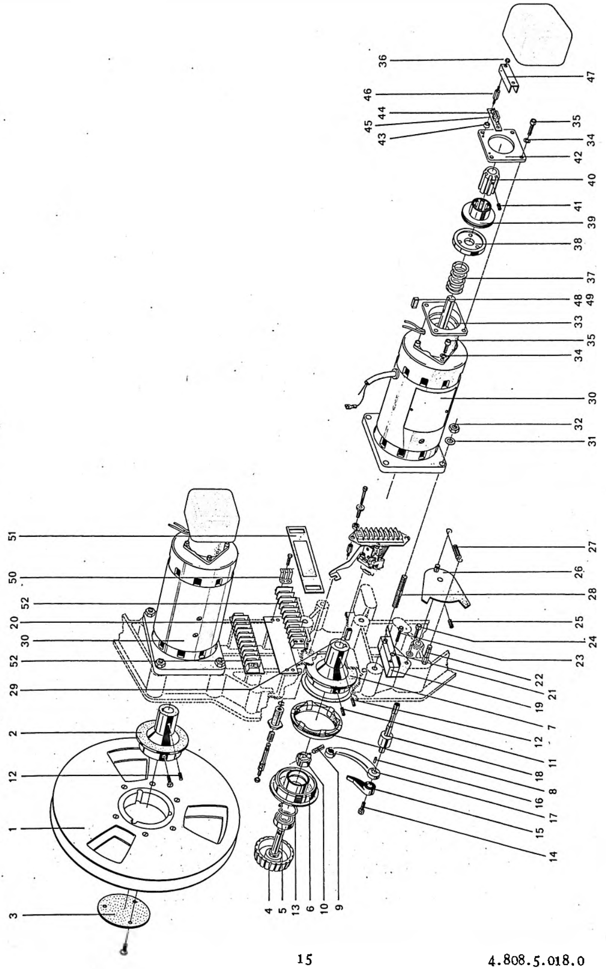
–	0687047 Y	AG. Aspiratore GE
1	0687058 N	Manopola filtro
2	0687057 Z	Flangia aspiratore
3	0687056 V	Filtro aspiratore
4	0687052 U	Scatola aspiratore
5	0687060 Q	Staffa sup. aspiratore
6	6331104 X	Rondella
7	6313148 W	Vite TCE 6MAx15
8	6313114 S	Vite TCE M4x8
9	6331106 F	Rondella piana ø 6,2
10	5618250 J	Passacavo
11	0687055 R	Prigioniero aspiratore
12	0687005 Y	Guarnizione aspiratore
13	0687054 M	Raccordo aspiratore
14	0839020 M	Passacavo
15	708768 S	Spazzola
–	0687048 M	AP. Motore aspiratore
16	6313114 S	Vite TCE M4x8
17	6331104 X	Rondella
18	5618054 V	Serracavo Looping tipo 2
19	5017845 Y	Condensatore 0,47 μF 400 VL
20	0001957 B	Motore GE43B162589
21	0687049 R	Squadretta condensatore
–	0672026 L	AG. Aspiratore Electrolux – 60 Hz
–	0672025 G	AG. Aspiratore Electrolux – 50 Hz
22	0672397 L	Gruppo filtro aspiratore
–	0672437 Q	AP. Cablaggio aspiratore – 60 Hz
–	0672436 L	AP. Cablaggio aspiratore – 50 Hz
23	0001654 G	Motore Electrolux – 50 Hz
24	0001852 C	Motore Electrolux – 60 Hz
25	9993658 T	Spazzola 98 tipo 1122
26	6441207 Y	Cuscinetto SKF 627
27	6441219 W	Cuscinetto SKF 629
28	5613526 M	Capocorda
29	6321104 W	Dado 4MA
30	5618052 C	Fermacavo
31	9940427 Z	Rondella ø 4,2
32	6311242 W	Vite TC 4MAx8
33	0672392 P	Gruppo staffa supporto superiore
34	9920355 G	Vite TC 3,5MAx14
35	9940427 Z	Rondella ø 4,2
36	0672396 Q	Staffa supporto aspiratore
37	5613333 D	Capocorda AMP
38	5618250 J	Gommino passafili
39	6313115 W	Vite TCE 4MAx10
40	9944421 N	Rondella elastica ø 4,2
–	0672163 C	AP. Montaggio filtro aspiratore
41	0672165 V	Coperchio filtro esterno
42	0672167 D	Rete per filtro
43	0672166 H	Filtro aspiratore
44	0672168 S	Perno filtro
45	6337109 D	Anello elastico
46	0672164 Z	Coperchio filtro interno
47	0672023 P	Fascia di chiusura
48	0672018 C	Perno
49	0672019 G	Perno
50	6313125 X	Vite TCE 4MAx50
51	6313132 B	Vite TCE 5MAx15
52	9940504 Z	Rondella ø 5



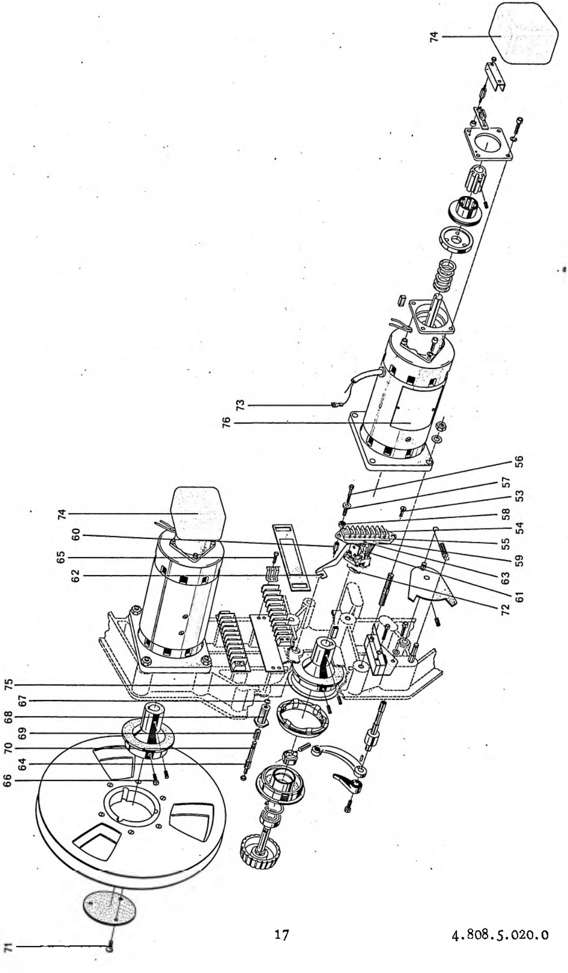
--	0842990 Z	AG. Aspiratore Siemens
1	5540440 X	Motore Siemens
2	0687426 Z	Flangia
3	0687424 R	Flangia
4	0687423 U	Fascetta
5	0674930 J	Coperchio
6	0674934 Q	Scatola
7	0687421 L	Flangia
8	3661045 A	Tubo flessibile Ø 45
9	6949336 S	Stringitubo Ø 37-47
10	5618672 E	Collarino Colson
11	5618013 C	Blocchetto Colson
12	0800871 R	Cavo Alasp
13	5618052 C	Cinturini serracavo
14	6321105 S	Dado M5
15	6311231 R	Vite TC 3x8
16	6311232 V	Vite TC 3x12
17	6311242 W	Vite TC 4x8
18	6312755 A	Vite TS 5x10
19	6313165 T	Vite TCCE 8x15
20	6313167 B	Vite TCCE 8x20
21	6331103 A	Rondella piana Ø 3,2
22	6331104 X	Rondella piana Ø 4,3
23	6331105 T	Rondella piana Ø 5,3
24	6331108 Y	Rondella piana Ø 8,4
25	6332103 N	Rondella elastica Ø 3,2
26	6332104 B	Rondella elastica Ø 4,3
27	6332108 C	Rondella elastica Ø 8,4
28	6321103 H	Dado M3
29	6321104 W	Dado M4



1	5676992 P	Bobina fissa
2	0687191 M	Corpo bobina fissa
3	0687193 Y	Coperchio
-	0687300 K	AG. Manopola IBM
4	0672043 R	Manopola
5	0001414 G	Cuscinetto
6	0687304 R	Flangia manopola
7	0687302 Y	Corpo bobina
8	0672387 K	Anello obbina
9	6341134 P	Spina 5x22
10	0672017 P	Camma manopola
11	6316113 A	Grano C.E. M4x10
12	6316135 V	Grano C.E. M6x10
13	6337522 M	Anello elastico
--	0687270 C	AG. Tastatore
14	6313116 F	Vite T.C.E. 4MAx20
15	0687276 J	Leva per tastatore
16	6341113 Y	Spina 3x18
17	0687269 D	Braccio tastatore
18	0687271 D	Albero tastatore
19	0000965 T	Microinterruttore
20	0001117 E	Piastrina numerata
21	6332104 B	Rondella elastica ∅ 4,3
22	0687280 M	Portamolla
23	6313120 V	Vite T.C.E. 4x25
24	6313115 W	Vite T.C.E. 4x10
25	6316102 R	Grano CE 3x6
26	0687272 R	Leva per albero tastatore
27	0687273 R	Molla per leva tastatore
28	0687010 K	Prigioniero
29	0687322 N	Chiavetta
30	0687321 A	Motore bobina
31	6331108 Y	Rondella ∅ 8,4
32	6321108 X	Dado M8
-	0687020 L	AG. Freno
33	0687021 M	Corpo freno
34	6332104 B	Rondella elastica ∅ 4,3
35	6313116 A	Vite T.C.E. 4x12
36	6321103 H	Dado M3
37	0687027 K	Molla
38	0687028 K	Anello freno
39	0687029 P	Corpo ferodo
40	0687033 W	Mozzo freno
41	6316111 S	Grano CE 4x6
42	0687032 S	Piastra freno
43	0687038 L	Distanziale
-	0687035 P	AP. Gruppo Pif
44	4933046 B	Resist. 100 Ω 2%
45	5822840 J	Diodo
46	0687039 Q	Colonnina Pif
47	0687040 N	Protezione Pif
48	0687017 V	Chiavetta
49	0687322 N	Chiavetta (per MTH 172)
50	0839653 U	Molletta tipo H
51	0839361 F	Protezione per morsettiera
52	5612550 E	Morsettiera Rhodex

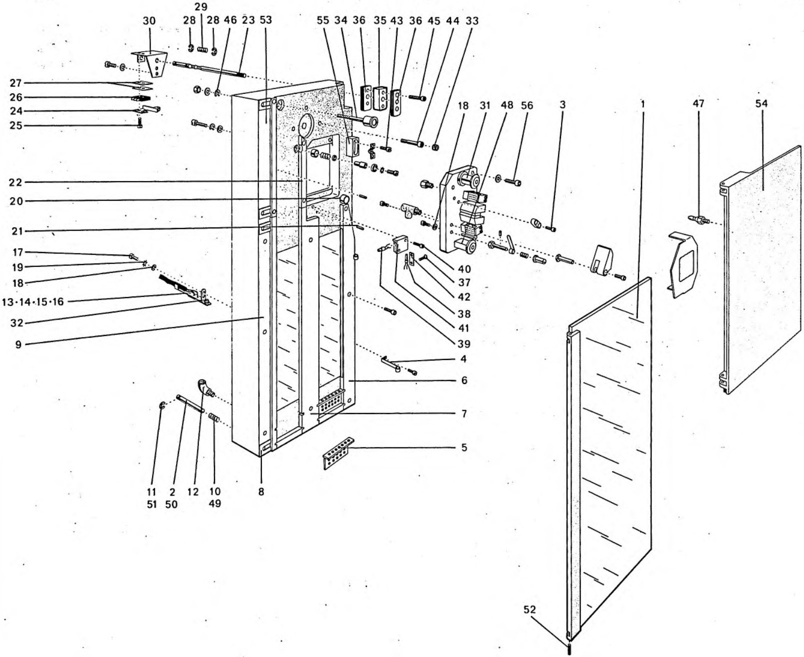


	0687306 Z	AG. Relè inibizione scrittura
53	6313115 W	Vite T.C.E. 4x10
54	0000882 N	Morsettiera
55	0000988 A	Piastrina numerata
56	6313121 W	Vite T.C.E. 4x30
57	0687309 N	Ghiera di regolazione
58	0687298 M	Ghiera
59	0687307 V	Piastrina
60	0687310 G	Colonnina
61	5303430 B	Relè FEME
62	0687308 J	Leva relè
63	6313702 Y	Vite T.S.C.E. 3x10
–	0687294 L	AG. Pulsante
64	0687299 R	Pulsante
65	6313117 W	Vite T.C.E. 4x15
66	0672032 L	Vite bloccaggio
67	6337109 D	Anello elastico
68	0687295 Q	Boccola
69	0687296 U	Molla
70	0687297 Y	Perno
71	6313738 H	Vite T.S.C.E. 6x15
72	0000797 Z	Diodo 1x8998 A
73	5613350 W	Capocorda AMP
74	0687024 J	Protezione
75	0672050 H	Anello bobina
76	0687450 H	Motore bobina (per MTH 172)



testina e parte anteriore (MUN 140)

1	0687226	M	Vetro portello inferiore spessore 10 mm
2	0687215	G	Perno per cerniera
3	6313102	L	Vite 3x10
4	0687163	J	Molla vetro
5	0687225	H	Squadretta
6	0687170	A	Gruppo parete destra
7	0687157	J	Gruppo parete centrale
8	0687221	G	Piastrina
9	0687218	D	Gruppo parete sinistra
10	0687222	L	Molla
11	6337109	D	Anello sinistro
12	6171350	N	Gomito ENOTS
13	0687180	K	Assieme fotoresist. inf. destra
14	0687178	J	Assieme fotoresist. sup. destra
15	0687179	D	Assieme fotoresist. inf. sinistra
16	0687177	L	Assieme fotoresist. sup. sinistra
17	6313096	W	Vite TCE 3x5
18	6331103	A	Rondella piana ∅ 3,2
19	6332103	N	Rondella dentellata ∅ 3,2
20	6469549	B	Rullino
21	0687006	C	Spina cilindrica ∅ 2
22	0687162	N	Parete centrale sup.
23	0687076	X	Perno
–	0687074	P	AG. Switch portello
24	0002105	M	Tastatore
25	0680063	P	Vite TC 2x13
26	0002104	R	Microinterruttore
27	0687078	Q	Distanziale
28	6337111	Y	Anello elastico
29	0687077	T	Molla richiamo
30	0687075	K	Supp. switch
31	0673285	D	Guida cilindrica
32	5852120	L	Fotoresistenza
33	0687251	B	Tappo
34	0687285	P	Rullino sup.
35	0687209	L	Guida nastro
36	0687206	X	Piastrina
–	0687241	N	AG. Fotosensore
37	0680705	X	Vite TS 2,6x4
38	0687243	J	Fotodiodo
39	0672352	B	Lampada CM8
40	6316102	R	Vite TCE 3x6
41	0672347	F	Gruppo corpo
42	0672354	U	Piastrina
43	6311245	K	Vite TC 4x15
44	6313120	V	Vite TCE 4x25
45	6313107	R	Vite TCE 3x25
46	6332105	F	Rondella elastica ∅ 5,3
–	0687231	H	AG. Portello superiore
47	0687236	N	Chiave portello
48	0673249	S	Guida rampata
49	0687222	L	Molla
50	0687215	G	Perno cerniera
51	6337109	D	Anello elastico
52	6341707	Q	Spina 2x20
53	0687237	J	Parete portello
54	0687239	M	Gruppo portello
55	0687255	C	Supporto molla
56	6311245	K	Vite TCE 4x15



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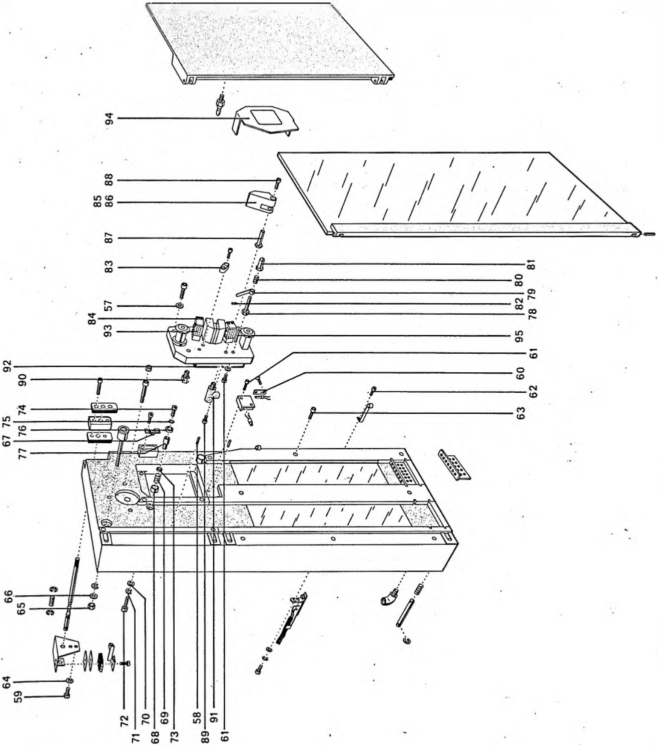
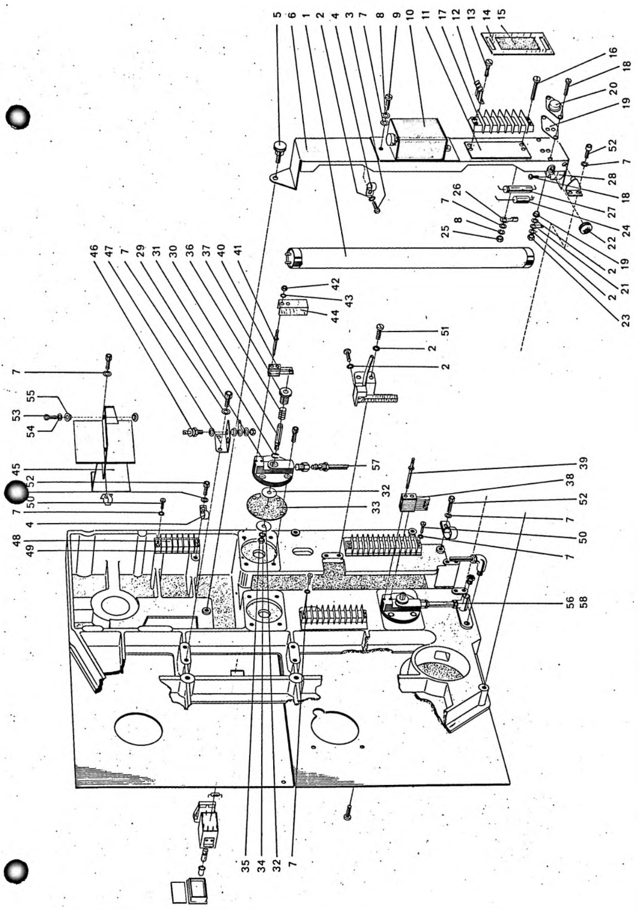
57	6332104	B	Rondella elastica ø 4,3
58	0687007	G	Spina cilindrica ø 3
59	6313115	W	Vite T.C.E. 4x10
60	0672354	U	Piastrina
61	6313104	D	Vite T.C.E. 3x15
62	0005044	D	Vite autofilettante 2,9x10
63	6313119	X	Vite T.C.E. 4x20
64	6331104	X	Rondella piana ø 4,3
65	6321105	S	Dado M5
66	6331105	T	Rondella piana ø 5,3
67	0687256	Q	Molla di chiusura
–	0673152	B	AG. Rullino guida nastro
68	0673158	V	Copertura molla
69	0673157	G	Molla guida nastro
70	9940357	J	Rondella piana ø 3,6
71	9944371	H	Rondella elastica ø 3,7
72	9920358	D	Vite T.C. 3,5x17
73	0673156	C	Anello mobile
74	0680221	W	Vite acc. inox 3x10
75	6332303	J	Rondella dentellata
76	0673154	U	Guida fissa superiore
77	0673153	F	Guida nastro
–	0646646	P	AG. Testina 7 tr. 18,75"/sec. Scoge 20
–	0645880	W	AG. Testina 7 tr. 37,5 "/sec. Scoge 40-80
–	0643376	A	AG. Testina 7 tr. 75"/sec. Scoge 80
–	0646752	R	AG. Testina 9 tr. 18,75"/sec. Scoge 20 Mod. A
–	0646522	J	AG. Testina 9 tr. 18,75"/sec. Scoge 20 Mod. T
–	0646521	E	AG. Testina 9 tr. 37,5 "/sec. Scoge 40
–	0643375	T	AG. Testina 9 tr. 75"/sec. Scoge 80 Mod. A

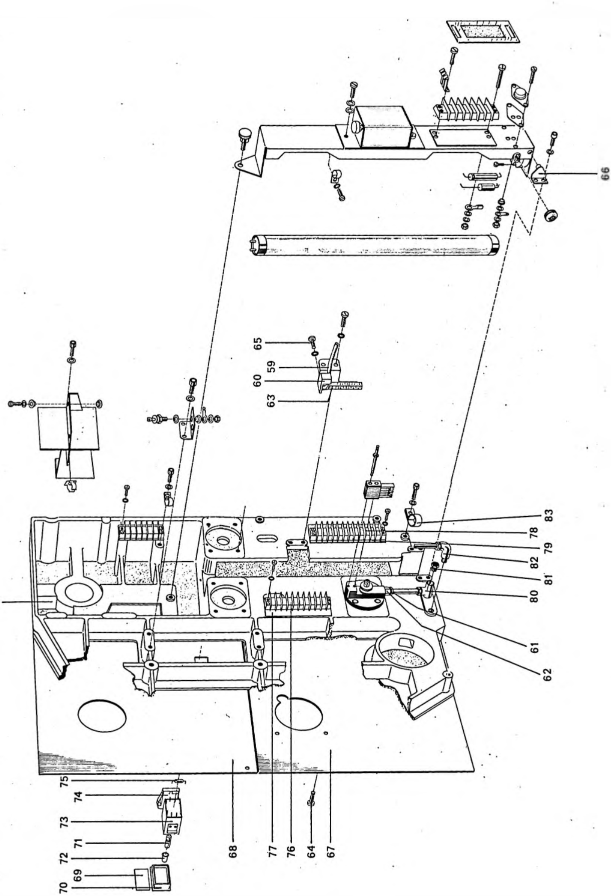
–	0673266	F	AP. Sgancio schermo
78	0673262	E	Perno supp. sgancio
79	0673264	X	Molla a balestra
80	0673265	T	Molla a spirale sgancio
81	0673263	A	Innesto sgancio schermo
82	6341501	B	Spina cilindrica
83	0673271	T	Arresto schermo
84	6313109	A	Vite T.C.C.E. 3x35
85	0673259	T	Supp. schermo
86	0673375	W	Schermo AMC (solo per mod. T)
87	0673260	Z	Perno supp. schermo
88	6313114	S	Vite T.C.E. 4x8
89	6311245	K	Vite T.C.E. 4x15
90	6171286	D	Raccordo tipo Z 120
91	6171380	Z	Raccordo a T ENOS Y 60
92	0673291	D	Conv. di aspir. (solo per Scoge 80)
93	0673282	Q	Gruppo pulitore
94	0673287	M	Coperchio testina
95	0673270	S	Perno di guida



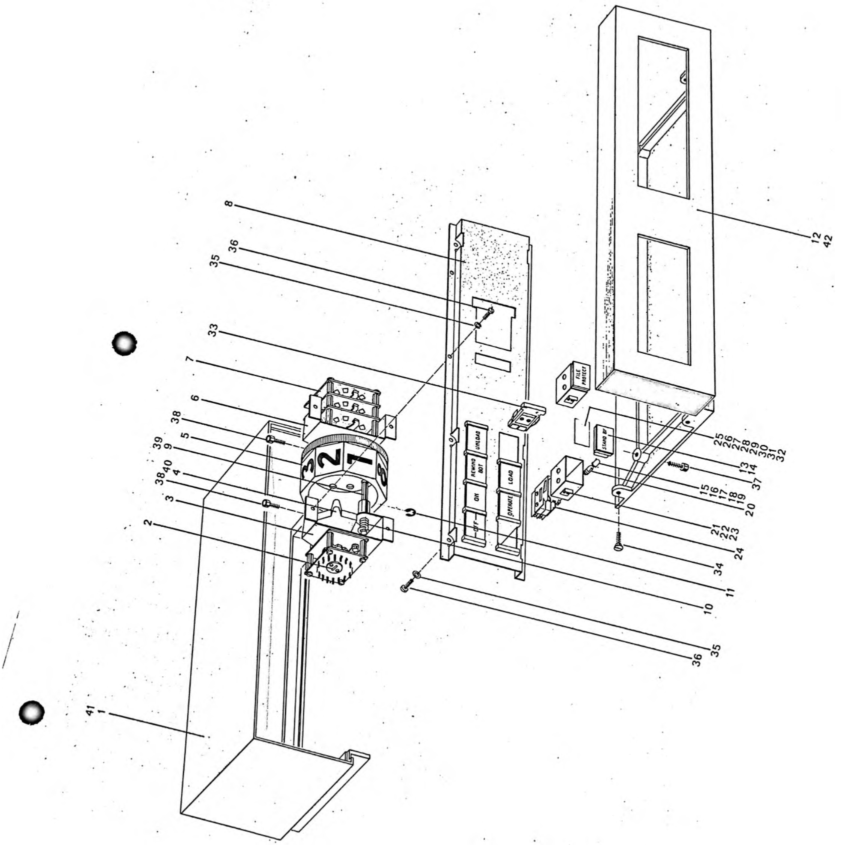
–	0687128 C	AG.	Piastra lampada
1	5572652 F		Lampada
2	6331103 A		Rondella ∅ 3,2
3	6311230 Q		Vite TC 3x6
4	5618052 C		Serracavo Looping N 1
5	0687134 C		Perno di chiusura
6	0687129 G		Piastra lampada
7	6331104 X		Rondella piana ∅ 4,3
8	6332104 B		Rondella elastica ∅ 4,3
9	6311242 W		Vite TC 4x8
10	0001973 C		Oscillatore bobine
11	5612960 T		Piastrina numerata
12	0839653 U		Molletta tipo H
13	6311244 P		Vite TC 4x12
14	0839357 P		Piastrina isolante
15	0831766 S		Targhetta
16	6311247 T		Vite TC 4x20
17	5612405 M		Morsettiera Rhodex K606–D
18	6311233 Z		Vite TC 3x12
19	5831025 P		Isolante per transistor
20	5836400 B		Transistor 2 N 3055
21	5613553 K		Capocorda
22	5618247 T		Passacavo
23	6321103 H		Dado M3
24	5003833 Q		Condens. 1,6 μF 63 VL
25	6321104 W		Dado M4
26	5613350 W		Capocorda
27	5041783 J		Condens. 50 μF 50 VL
28	5571690 C		Porta lampada
–	0687100 P	AG.	Switch di riferimento
–	0687084 Y	AG.	Switch di fuori programma
29	0687085 U		Corpo switch
30	0687090 T		Perno switch
31	6337109 D		Anello di tenuta
32	0687091 U		Membrana switch
33	0687092 G		Membrana switch
34	6332103 N		Rosetta elastica
35	6321103 H		Dado M3
36	0687093 C		Molla switch
37	0687094 Z		Ghiera
38	5300081 H		Contatti Zettler tipo 2519
39	0687095 V		Perno per contatti
40	5300087 J		Contatti Zettler tipo 1684
41	0687096 H		Perno per contatti
42	0682865 D		Dado M2
43	0683039 P		Rondella ∅ 2
44	0687097 D		Protezione contatti
45	0687081 T		Supp. Conn. testina
46	0001467 R		Diodo
47	0687110 C		Squadretta diodi
48	0000882 N		Morsettiera K 506/A
49	0687072 W		Piastrina numerata
50	6313117 W		Vite TCE 4x15
51	6311231 R		Vite TC 3x8
52	6313115 W		Vite TCE 4x10
53	6311233 Z		Vite TC 3x12
54	6331103 A		Rondella piana ∅ 3,2
55	5831025 P		Boccola isolante
56	0687142 L		Tubetto di raccordo mm 70
57	0687146 M		Tubetto di raccordo mm 295
58	0687150 G		Tubetto di raccordo mm 580



59	0687102	U	Barra fluorescente
60	0687104	M	Gruppo fotodiodo
61	6171282	C	Dado Benton
62	6171274	L	Bussola Benton
63	0001970	T	Fotodiodo
64	6348290	X	Vite autofilettante
65	6311230	Q	Vite TC 3x6
66	0687132	K	Squadretta
67	0687187	V	Copertura inferiore
68	0687184	R	Copertura superiore
–	0687196	S	AG. Indicatore freni
69	0836830	R	Targhetta
70	0001155	S	Schermo indicatore
71	0001823	D	Lampadina 20 V
72	0001511	D	Filtro bianco
73	0001554	W	Unità 4 lampadini
74	5141504	Y	Separatore
75	4932725	W	Resist. 51 Ohm
76	5612438	H	Morsettiera Rhodex K 510/A
77	0687070	R	Piastrina numerata
78	5612594	Z	Morsettiera Rhodex K 512/A
79	0687071	J	Piastrina numerata
80	6171380	T	Raccordo a T ENOTS
81	0001669	E	Tappo ENOTS
82	6171350	N	Gomito ENOTS
83	5618054	V	Serracavo Looping N 2
84	0687002	B	Piastra base

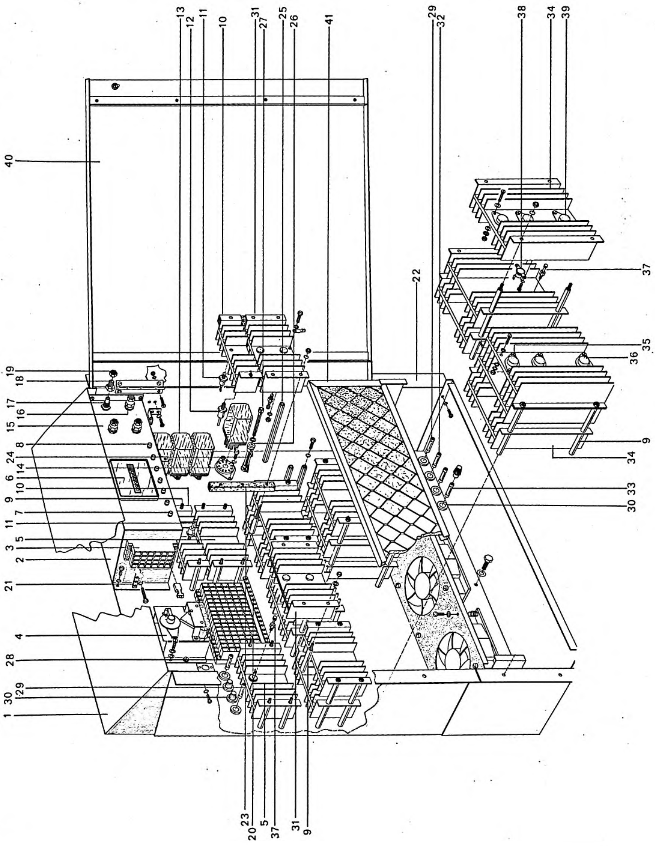


1	0675443 D	Copertura Console
2	5114315 F	Commutatore
3	0819138 C	Supporto leva
4	0838256 M	Leva (fino a matr. 1199)
5	0838259 A	Ruota numerata
6	0838257 R	Supporto numeratore
7	5114310 D	Commutatore
8	0838266 N	Telaio Console
9	0838254 D	Perno(fino a matr. 1199)
10	0838255 H	Molla
11	6337111 Y	Anello elastico
12	0675606 N	Console
13	0001155 S	Piastrina senza separatore
14	0001156 E	Piastrina con separatore
15	0001163 A	Filtro blu
16	0001162 E	Filtro verde
17	0001511 D	Filtro bianco
18	0001160 Z	Filtro rosso
19	0001161 S	Filtro giallo
20	0001823 D	Lampada 20V ASA
21	0001149 S	Unità per indicatori à 4 lamp.
22	0001153 H	Unità per indicatori a 2 lamp.
23	0001148 W	Unità per indicatori tipo 2C1
24	0001151 Z	Unità Elettrica tipo 2D2
25	0831797 H	Cartellino OFF
26	0831805 P	Cartellino ON
27	0838147 N	Cartellino Rewind-Bot
28	0831792 C	Cartellino Standby
29	0831791 Y	Cartellino operate
30	0839257 M	Cartellino Load
31	0831108 M	Cartellino Unload
32	0831106 U	Cartellino File-Protect
33	5141504 Y	Separatore
34	6313712 M	Vite TS M3x15
35	6331103 A	Rondella piana ø 3,2
36	6311231 R	Vite TC M3x8
37	6313101 G	Vite TCE M3x8
38	6313115 W	Vite TCE M4x10
39	0819135 F	Perno (da matr. 1200)
40	0819134 B	Leva (da matr. 1200)
41	0676340 W	Copertura Console (tipo nuovo)
42	0676339 Y	Copertura console frontale (tipo nuovo)

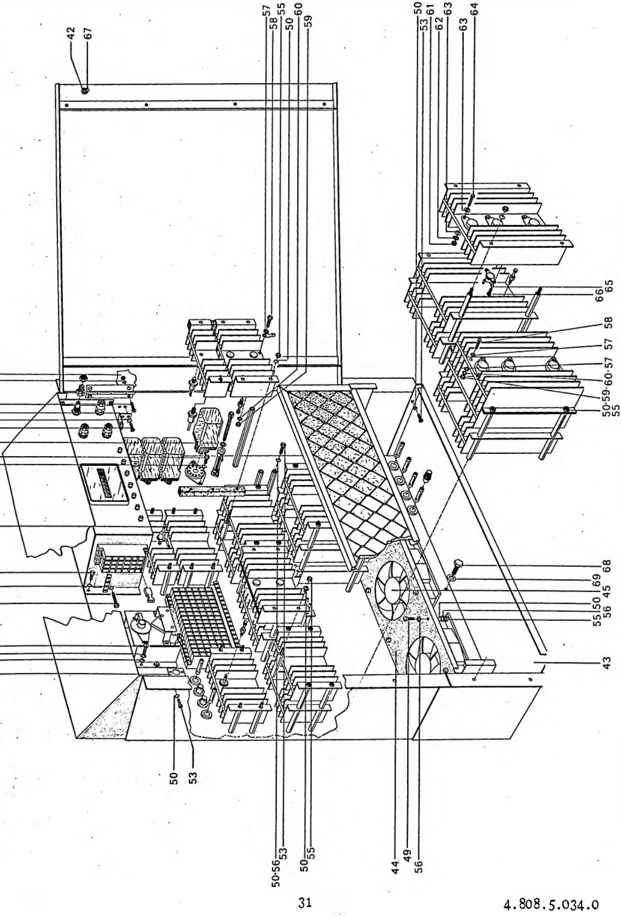

UNLOAD
REWIND BOT
ON
OFF
LOAD
OPERATE
FILE PROTECT
STAND BY

alimentatore vista anteriore (ALI 040) (preserie) MTH 101÷172 MTC 101÷173

1	0838131 C	Deflettore
2	0838116 P	Supporto
3	0830388 L	Connettore Faston
4	0001725 B	Relé ritardato 220 V 50 Hz
5	0842443 A	Dissipatore con diodi 4 A F2R
6	0000898 H	Contaore 220 V 50 Hz
7	5610024 T	Boccola pup. nera
8	5610021 W	Boccola pup. rossa
9	0838137 M	Distanziatore
10	0838143 M	Dissipatore senza diodi
11	0001301 C	Diodo Zener 10Z 10
12	0002139 D	Diodo Zener 10Z 5,6
13	0001385 H	Relé Potter
14	0001370 W	Zoccolo per relé
15	0838127 L	Supporto console
16	4991375 W	Potenziometro 1000Ω 2 W
17	4991310 M	Potenziometro 500Ω 2 W
18	4999550 X	Boccola bloccaggio
19	4999530 V	Dado bloccaggio
20	0839274 B	Barretta bloccaggio connettori
21	0839261 R	Barretta bloccaggio connettori
22	0842346 V	Supporto trasformatori
23	0838032 X	Traversina isolante
24	0002143 L	Resistenza 560Ω 15 W
25	0838078 M	Distanziatore
26	0001506 V	Supporto 1D10 SECI
27	6313113 D	Vite TCE 3MAx55
28	0001264 Z	Fusibile 5A
29	0001253 B	Fusibile 10A
30	0001238 X	Portafusibile
31	0842442 E	Dissipatore con diodi 4A F2R
32	0001262 B	Fusibile 3A
33	0001249 U	Fusibile 2A
34	0838141 D	Dissipatore
35	5835456 W	Transistor 2NA56A
36	5831016 S	Transistor ASZ16
37	5613569 E	Torretta Gregorini
38	5241302 D	Termostato Klixon
39	5836400 B	Transistor 2N3055
40	0838117 K	Porta
41	3361210 Z	Filtro

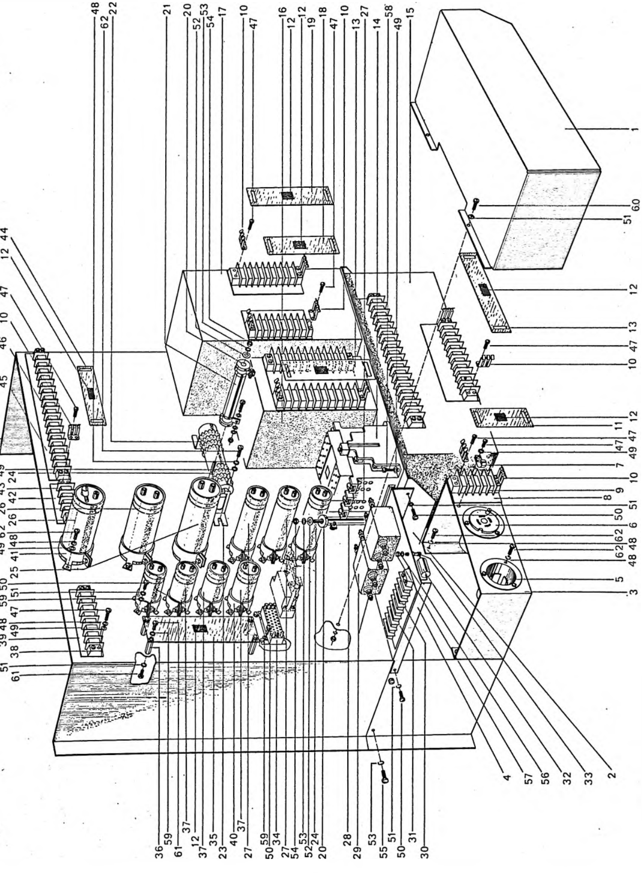


42	1952184	Z	Rondella Cambloc
43	0838028	Q	Fondo
44	0838415	R	Supporto ventilatori
45	0001614	C	Ventilatore Rotran
46	6331104	X	Rondella piana ø 4,3
47	6332104	B	Rondella elastica ø 4,3
48	6311242	W	Vite TC 4MAx8
49	6311234	N	Vite TC 3MAx15
50	6321103	H	Rondella elastica ø 3,2
51	6311231	R	Vite TC 3MAx8
52	0838077	Y	Squadretta
53	6311230	Q	Vite TC 3MAx6
54	0838140	C	Distanziatore
55	6321103	H	Dado 3MA
56	6331103	A	Rondella piana ø 3,2
57	0682456	X	Rondella piana ø 4,3
58	0680540	D	Vite TC M4x12
59	0682260	E	Dado M4
60	0683086	F	Rondella dentallata ø 4,3
61	0682160	C	Dado M3
62	0683066	V	Rondella dentellata ø 3,2
63	0682454	P	Rondella piana ø 3,2
64	0680228	U	Vite TC M3x12
65	0683041	N	Rondella elastica ø 2,8
66	0680112	F	Vite TC 2,6MAx6
67	1952133	X	Stelo cambloc
68	6311268	J	Vite TC 6MAx10
69	6332306	D	Rondella elastica ø 6,1
70	0838274	F	Blocchetto


50·59·60·57
50·56

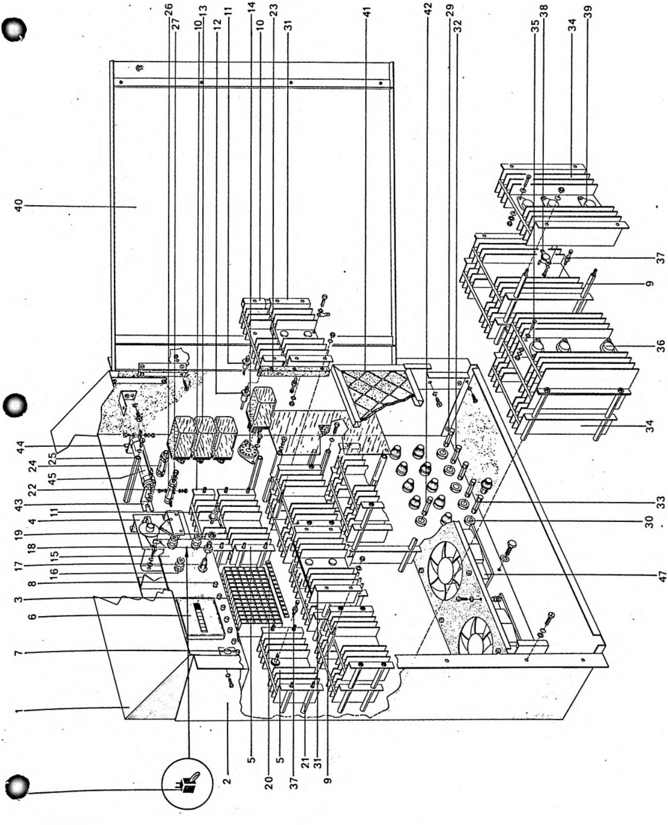
alimentatore vista posteriore (ALI 040) (preserie)

1	0837970 K	Protezione
2	0838119 C	Supporto trasformatore
3	0837885 V	Supporto connettori
4	0838027 T	Supporto morsettiera
5	0001574 G	Connettore
6	5615700 E	Connettore
7	5618052 C	Serracavo Looping tipo 1
8	0000867 H	Piastrina numerata
9	0000665 C	Morsettiera K 605 D
10	0839653 U	Molletta tipo A
11	0839356 K	Protezione morsettiera
12	0831766 S	Targhetta
13	0839361 F	Protezione morsettiera
14	5326245 M	Teleruttore
15	5455218 Q	Trasformatore T4000/32/18
16	5455217 T	Trasformatore T4000/32/17
17	5455212 W	Trasformatore T4000/32/19
18	0839359 G	Protezione morsettiera
19	0839360 E	Protezione morsettiera
20	0001932 C	Supporto tipo ID16
21	4972393 G	Resistenza 22 Ω 50 W
22	4970350 E	Resistenza variabile 0,47 Ω 155 W
23	4999052 B	Supporto tipo SB23
24	0838133 L	Tirante
25	0001319 T	Condensatore 3000 µF 70 VL
26	0001324 X	Condensatore 1100 µF 25 VL
27	0002125 B	Condensatore 3200 µF 40 VL
28		Resistenza 82 Ω 50 W
29	5091060 F	Filtro tipo 120-124
30	5612540 O	Morsettiera K 608/A
31	0838126 Q	Piastrina stampigliata P11
32	5017845 Y	Condensatore 0,47 µF
33	5613569 E	Tarretta Gregorini
34	0842491 F	Connettore AMP
35	0837883 B	Protezione relé
36	0838081 Y	Distanziatore
37	0001307 L	Condensatore 1000 µF 40 VL
38	0001692 T	Morsettiera K608
39	0838123 K	Piastrina stampigliata P8
40	0001402 Q	Fascetta
41	0002138 H	Fascetta
42	0838125 C	Piastrina stampigliata P12
43	0001798 P	Morsettiera K604
44	0839355 F	Protezione morsettiera
45	0838124 G	Piastrina stampigliata P7
46	0001793 Z	Morsettiera K617
47	6311245 K	Vite TC M4x15
48	6332104 B	Rondella elastica ∅ 4,3
49	6331104 X	Rondella piana ∅ 4,3
50	6311230 Q	Vite TC 3MAx6
51	6332103 N	Rondella elastica ∅ 3,2
52	6331105 T	Rondella piana ∅ 5,3
53	6332105 F	Rondella elastica ∅ 5,3
54	6321105 S	Dado 5MA
55	6311258 C	Vite TC 5MAx15
56	0683041 N	Rondella elastica ∅ 2,8
57	0682080 V	Dado 2,6MA
58	6311247 T	Vite TC 4MAx20
59	6331103 A	Rondella piana ∅ 3,2
60	6311231 R	Vite TC 3MAx8
61	6311232 V	Vite TC 3MAx10
62	6311242 W	Vite TC 4MAx8



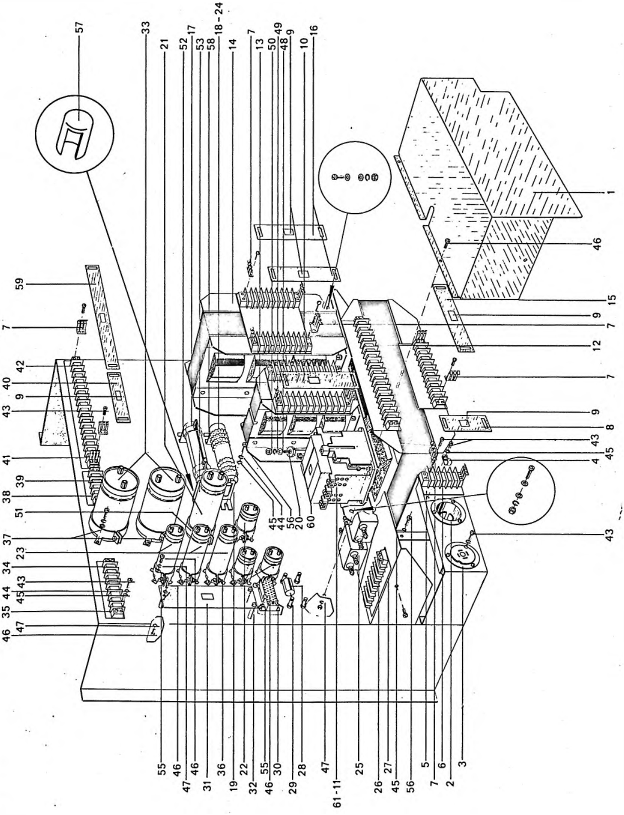
alimentatore vista anteriore (ALI 040) (serie)

1	0837490 A	Deflettore
2	0837481 A	Supporto
3	0830388 L	Connettore Faston
4	0001725 B	Relé ritardato 220 V – 50 Hz
5	0842780 D	Dissipatore con diodi 4A F2R
6	0000898 H	Contaore 220 V – 50 Hz
	0001317 A	Contaore 220 V – 60 Hz
7	5610024 T	Boccola pup. nera
8	5610021 W	Boccola pup. rossa
9	0838137 M	Distanziatore
10	0838143 M	Dissipatore senza diodi
11	5826525 U	Diodo Zener Z10
12	0002139 D	Diodo Zener 10Z
13	0001385 H	Relé Potter
14	0001370 W	Zoccolo per relé
15	0837489 C	Supporto console
16	4991375 W	Potenziometro 1000 Ohm 2 W
17	4991310 M	Potenziometro 500 Ohm 2 W
18	4999550 X	Boccola bloccaggio
19	4999530 V	Dado bloccaggio
20	0839271 E	Barretta bloccaggio connettori
21	0838137 M	Distanziatore
22	4973230 K	Resistenza 150 Ohm 15 W
23	0838032 X	Traversina isolante
24	0002143 L	Resistenza 560 Ohm 15 W
25	0838078 M	Distanziatore
26	0001506 V	Supporto 1D10 SECI
27	6313113 D	Vite TCE 3MAx55
28	0001264 Z	Fusibile 5A
29	0001253 B	Fusibile 10A
30	0001238 X	Portafusibile
31	0842781 C	Dissipatore con diodi 4AF2N
32	0001259 V	Fusibile 1A
33	0001249 U	Fusibile 2A
34	0838141 D	Dissipatore
35	5835456 W	Transistor 2N456A
36	5831016 S	Transistor ASZ16
37	5613569 E	Torretta Gregorini
38	5241302 Y	Termostato Klixon
39	5836400 B	Transistor 2N3055
40	0838117 K	Porta
41	3361210 Z	Filtro
42	0001216 C	Fusibile 1/8 A
43	4999027 E	Supporto assiale
44	4999026 H	Supporto traversale
45	4973245 N	Resistenza 100 Ohm 50 W
46	5102100 E	Interruttore unip.
47	0001614 C	Ventilatori ROTRON

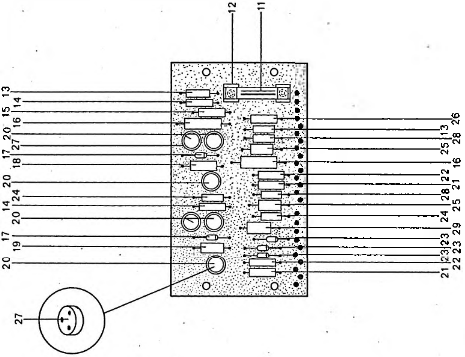


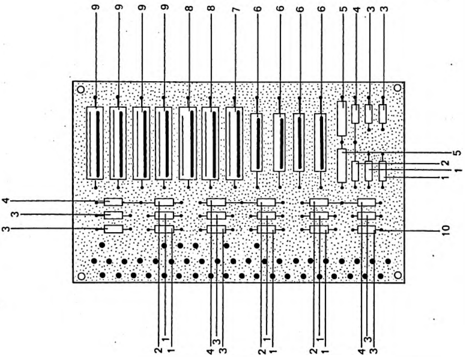
alimentatore vista posteriore (ALI 040) (serie)

1	0837491 B	Protezione
2	0001574 G	Connettore
3	5615700 E	Connettore
4	5618052 C	Serracavo Looping tipo 1
5	5612965 S	Piastrina numerata
6	0000665 C	Morsettiera K 605 D
7	0839653 U	Molletta tipo A
8	0839356 K	Protezione morsettiera
9	3543104 P	Targhetta
10	0839358 C	Protezione morsettiera K 607
11	5326245 M	Teleruttore (in alternativa con voce 61)
12	5455252 S	Trasformatore T4000/32/24
13	5455260 N	Trasformatore T4000/32/28
14	5455255 P	Trasformatore T4000/32/25
15	0839361 F	Protezione morsettiera
16	0839360 E	Protezione morsettiera
17	4972393 G	Resistenza 22 Ohm 50 W
18	4970351 F	Resistenza variabile 0,24 + 0,44 Ohm 155 W
19	4999052 B	Supporto tipo SB23
20	0838201 P	Tirante
21	0001319 T	Condensatore 3000 μF 70 VL
22	0001307 L	Condensatore 1000 μF 40 VL
23	0002125 B	Condensatore 3200 μF 40 VL
24	4970089 X	Resistenza 0,1 Ohm 155 W (Per 75")
25	5427060 F	Filtro tipo 100-24
26	5612447 M	Morsettiera K 606/A
27	5612999 E	Piastrina TP 0-606
28	5427070 H	Condensatore (RC) 0,5 MF 10 Ohm 320 V
29	5613569 E	Torretta Gregorini
30	0842491 F	Connettore AMP 34 CT
31	0837286 B	Protezione Relé
32	0837289 Y	Distanziatore
33	5038900 X	Condensatore 17000 μF 30 VL
34	0001692 T	Morsettiera K 608
35	0838123 K	Piastrina stampigliata P8
36	0001402 Q	Fascetta per condensatore
37	0005133 G 5091075 A	Fascetta per condens. ICAR Fascetta per condens. SPRAGUE
38	0838125 C	Piastrina stampigliata P12
39	0001798 P	Morsettiera K 604
40	0839355 F	Protezione morsettiera
41	0838124 G	Piastrina stampigliata P7
42	0001793 Z	Morsettiera K 617
43	6311245 K	Vite TC MAx15
44	6332104 B	Rondella elastica ∅ 4,3
45	6331104 X	Rondella piana ∅ 4,3
46	6311230 Q	Vite TC 3MAx6
47	6332103 N	Rondella elastica ∅ 3,2
48	6331105 T	Rondella piana ∅ 5,3
49	6332105 F	Rondella elastica ∅ 5,3
50	6321105 S	Dado 5MA
51	0002138 H	Fascetta condensatore
52	4999026 H	Supporto SECI trasv.
53	4999027 E	Supporto SECI assiale
54	6311247 T	Vite TC 4MAx20
55	6331103 A	Rondella piana ∅ 3,2
56	6311242 W	Vite TC 4MAx8
57	0837189 W	Protezione condens.
58	4999053 F	Supp. trasversale SECI
59	0839368 D	Protezione
60	4972646 D	Resist. per telerutt. KLOCKNER
61	5326624 X	Telerutt. KLOCKNER MOELLER

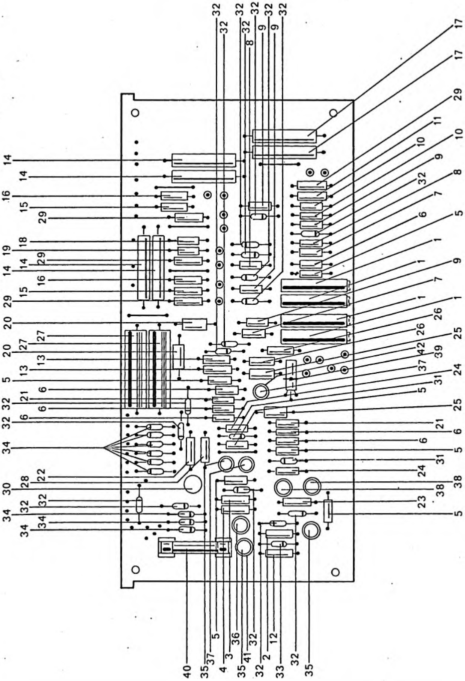

18 - 24
61 - 11

-	0620280 V	AG.	Piastrina PIRE
1	4961050 R		Resistenza 0,47 Ω 3 W
2	4932525 S		Resistenza 33 Ω $\frac{1}{2}$ W
3	4933805 K		Resistenza 620 Ω $\frac{1}{2}$ W
4	4933687 N		Resistenza 470 Ω $\frac{1}{2}$ W
5	0001308 A		Resistenza 330 Ω 5 W
6	4940437 V		Resistenza 0,25 Ω 1 W
7	4971072 C		Resistenza 1 Ω 10 W
8	0810507 Z		Resistenza 0,2 Ω 20 W
9	4970071 L		Resistenza 0,1 Ω 10 W
10	0832547 C		Torrette Olivetti
-	0620278 K	AG.	Piastrina SICA 80
11	0001220 X		Fusibile 1A 250 V
12	0000711 G		Portafusibile
13	4934047 U		Resistenza 1 KΩ
14	4925050 N		Resistenza 10 KΩ
15	4924770 R		Resistenza 5,6 KΩ
16	4963756 C		Resistenza 510 Ω 5 W
17	0000843 E		Diodo 1S2075A
18	5006850 E		Condensatore 22 KpF 160 V
19	5003395 L		Condensatore 0,1 µF 63 V
20	5833402 K		Transistor 2N527
21	4933531 W		Resistenza 330 Ω
22	4922850 R		Resistenza 68 Ω
23	0001434 A		Diodo P100
24	4934327 P		Resistenza 2 KΩ
25	0000844 T		Resistenza 820 Ω 3 W
26	4924523 W		Resistenza 3,3 KΩ
27	0839831 F		Distanziale
28	4933725 S		Resistenza 510 Ω
29	4962072 C		Resistenza 10 Ω 3 W

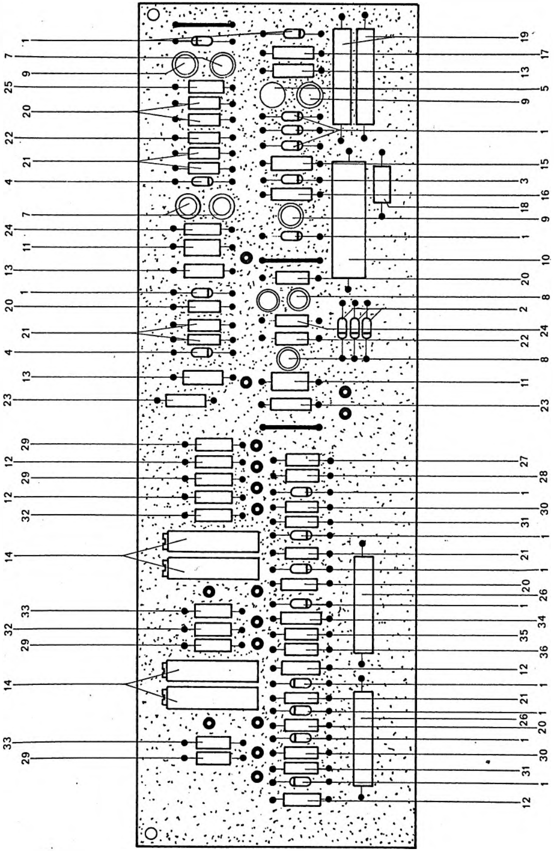




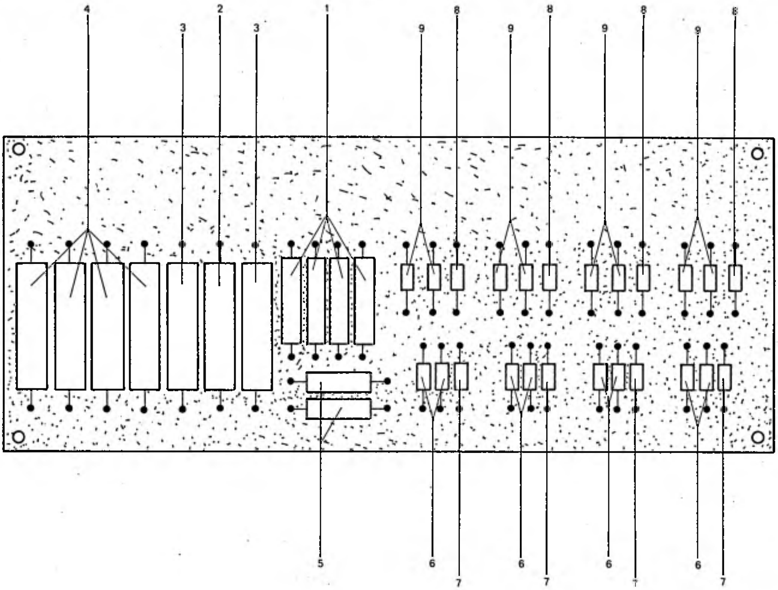
-	0620277 W	AG. Piastrina TECA 20
1	4991300 Y	Resistenza variabile 500
2	4924532 W	Resistenza 3,3 KΩ
3	4924210 H	Resistenza 1,5 KΩ
4	4924690 Z	Resistenza 4,7 KΩ
5	4934367 K	Resistenza 2,2 KΩ
6	4934327 P	Resistenza 2 KΩ
7	4934086 C	Resistenza 1,1 KΩ
8	4933887 B	Resistenza 750 Ω
9	4934047 U	Resistenza 1 KΩ
10	4935047 Y	Resistenza 10 KΩ
11	4926450 Z	Resistenza 270 KΩ
12	4924370 H	Resistenza 2,2 KΩ
13	4923690 C	Resistenza 470 Ω.
14	4963878 J	Resistenza 680 Ω
15	4934207 X	Resistenza 1,5 KΩ
16	4925610 M	Resistenza 39 KΩ
17	0001796 W	Resistenza 120Ω 7 W
18	4935687 F	Resistenza 47 KΩ
19	4934287 T	Resistenza 1,8 KΩ
20	4962710 W	Resistenza 47Ω
21	4934527 Y	Resistenza 3,3 KΩ
22	4923050 W	Resistenza 100Ω
23	4924050 J	Resistenza 1 KΩ
24	4932525 S	Resistenza 33Ω
25	5003395 L	Condensatore 0,1 /uF 63 VL
26	5031710 Z	Condensatore 47 uF 6 VL
27	0001436 J	Condensatore 100 uF 50 VL
28	5031710 Z	Condensatore 47 uF 6 VL
29	5037435 G	Condensatore 10 uF 20 VL
30	0001996 R	Diodo 2N1595 SCR
31	5826832 X	Diodo 1S2068A
32	5822725 X	Diodo EB1361
33	5824782 H	Diodo Zener 1S 2047/A
34	0001434 A	Diodo P100
35	0000813 B	Transistor 1W8918
36	5835750 N	Transistor 2N1711
37	5835860 A	Transistor 1W8907
38	5835527 Z	Transistor 2N527
39	5831301 M	Transistor BCZ11
40	0001220 X	Fusibile 1 A 250 V
41	0839831 F	Distanziale
42	0839833 P	Distanziale



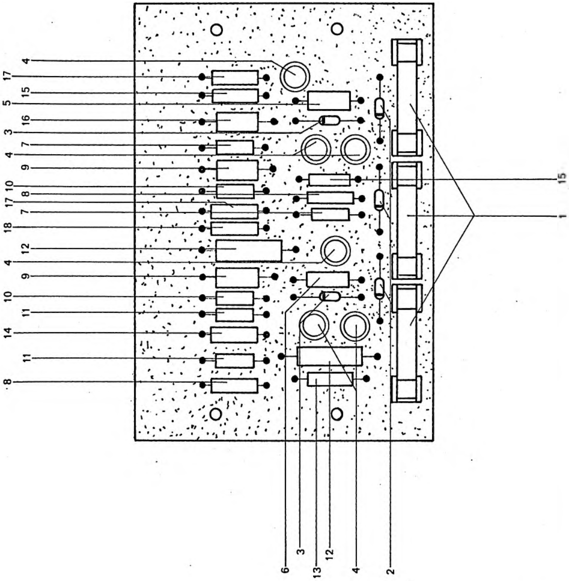
	0620244 P	AG. TECA 81
1	5822725 X	Diodo EB 1361
2	0001434 A	Diodo PAE 100
3	5824782 H	Diodo Zener 1S2047
4	5826832 X	Diodo Zener 1S2068/A
5	0001996 R	Diodo SCR 2N 1595
6	5835750 N	Transistor SGS 2N1711
7	0000726 N	Transistor SGS 1W8916
8	5835860 A	Transistor SGS 1W8907
9	0000813 B	Transistor SGS 1W8918
10	0001501 Q	Condensatore 100 µF 50 V
11	5003395 L	Condensatore 0,1 µF 63 V
12	5037435 G	Condensatore 10 µF 20 V
13	5031710 Z	Condensatore 47 µF 6 V
14	4991300 V	Potenziometro 500Ω
15	4924532 W	Resistenza 3,3 KΩ
16	4924370 H	Resistenza 2,2 KΩ
17	4923050 V	Resistenza 100Ω
18	4962710 W	Resistenza 47Ω 3W
19	4963878 J	Resistenza 680Ω 7W
20	4934367 K	Resistenza 2,2 K 2%
21	4934327 P	Resistenza 2 KΩ 2%
22	4934527 Y	Resistenza 3,3 KΩ 2%
23	4923690 C	Resistenza 470Ω
24	4932526 E	Resistenza 33Ω
25	4924050 J	Resistenza 1 KΩ
26	0001796 W	Resistenza 120Ω 7W
27	4935687 F	Resistenza 4,7 KΩ 2%
28	4934278 T	Resistenza 1,8 KΩ 2%
29	4933887 B	Resistenza 750Ω 2%
30	4925530 N	Resistenza 33 KΩ
31	4934207 X	Resistenza 1,5 KΩ 2%
32	4934047 U	Resistenza 1 KΩ 2%
33	4934086 C	Resistenza 1,1 KΩ 2%
34	4926450 Z	Resistenza 270 KΩ
35	4934926 Q	Resistenza 8,2 KΩ 2%
36	4934965 G	Resistenza 9,1 KΩ 2%



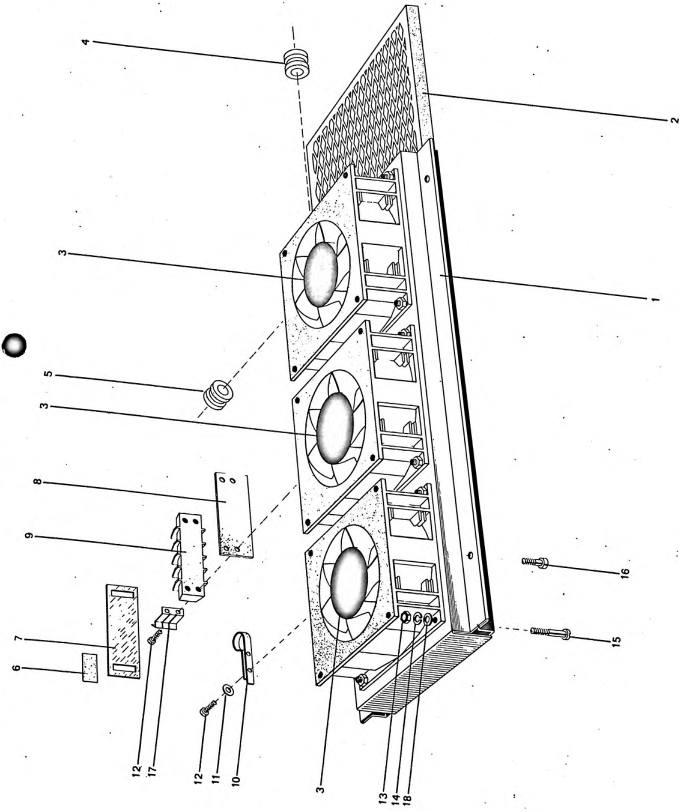
-	0620245 K	AG. Piastrina CARE			
1	4940437 V		Resistenza	0,25 Ω	1W
2	4971082 A		Resistenza	2,2 Ω	10W
3	4970110 D		Resistenza	0,22 Ω	15W
4	4970071 L		Resistenza	0,1 Ω	10W
5	0001308 A		Resistenza	330 Ω	5W
6	4933805 K		Resistenza	620 Ω	2%
7	4933687 N		Resistenza	470 Ω	2%
8	4932526 E		Resistenza	33 Ω	2%
9	4961050 R		Resistenza	47 Ω	3W



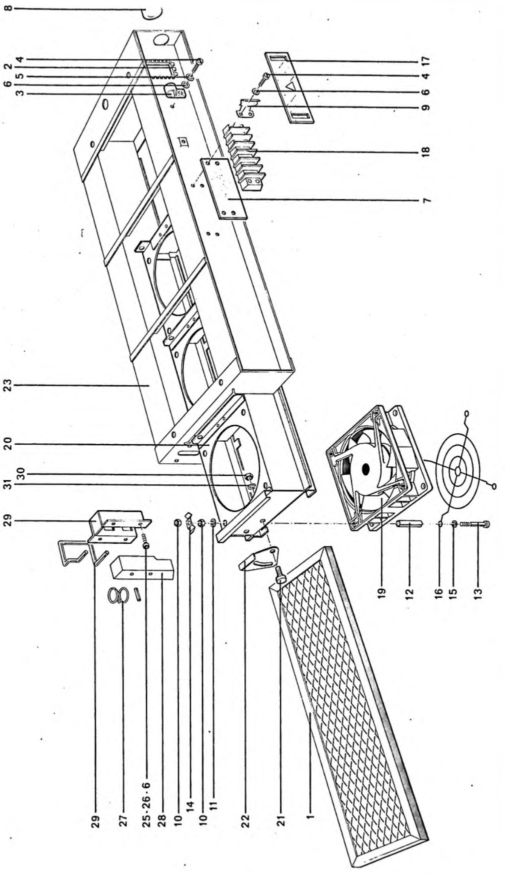
-	0620246 X	AG.	Piastrina SICA-81
1	0001218 V		Fusibili 0,5A - 250 V
2	0001434 A		Diodo PAE P100
3	0000843 E		Diodo 1S2075/A
4	0000726 N		Transistor 1W 8916
5	5003395 L		Condensatore 0,1/uF 63 V
6	5006845 F		Condensatore 22 KpF 200 V
7	4934327 P		Resistenza 2KΩ 2%
8	4925050 N		Resistenza 10KΩ
9	0000844 T		Resistenza 820Ω 10%
10	4933725 S		Resistenza 510Ω 2%
11	4934047 U		Resistenza 1 KΩ 2%
12	4963756 C		Resistenza 510 Ω 5W 10%
13	4924770 R		Resistenza 5,6 KΩ
14	4924532 W		Resistenza 3,3 KΩ
15	4922770 Y		Resistenza 56Ω
16	4962072 Q		Resistenza 10Ω 3W 10%
17	4923530 U		Resistenza 330Ω
18	4923050 V		Resistenza 100Ω



–	0646457 Q	AG.	Ventilatore
1	0675542 B		Piastra ventilatori
2	3361209 U		Filtro
3	0001614 C		Ventilatore
4	0001108 E		Passacavo
5	0001853 G		Passacavo
6	0831766 S		Targhetta
7	0839355 P		Piastrina di protezione
8	0001799 K		Piastrina numerata
9	0001798 P		Morsettiera Rodex
10	5618052 C		Serracavo Looping tipo 1
11	6331104 X		Rondella piana ø 4,3
12	6311245 J		Vite TC M4x15
13	6321103 H		Dado M3
14	6332103 N		Rondella elastica ø 3,2
15	6311234 N		Vite TC M3x15
16	6313115 W		Vite TCE M4x10
17	0839653 U		Molletta tipo A
18	6331103 A		Rondella piana ø 3,2



–	0646991 E	AG.	Ventilatore
1	3361209 U		Filtro
2	0001858 W		Listello passacavo
3	5618052 C		Serracavo looping
4	6311247 J		Vite TC 4 x 15
5	6332104 B		Rond. Elast. Ø 4,3
6	6331104 X		Rond. piana Ø 4,3
7	5612999 E		Piastrina numerata
8	5618243 S		Passacavo in gomma
9	0839653 U		Molletta tipo A
10	6321103 H		Dado M3
11	6331103 A		Rond. piana Ø 3,2
12	0838723 X		Distanziatore
13	7454750 B		Vite M3 x 50
14	0837215 Q		Molla blocca dadi
15	6321103 N		Rond. elast. Ø 3,2
16	5541340 N		Griglia ventilatore
17	0839357 P		Piastrina isolante
18	5612447 N		Morsettiera Rhodex
19	0001614 C		Ventilatore
–	0675866 V	AP.	Telaio portaventil.
20	0675867 Z		Telaio portavent.
21	0675876 W		Stud arresto guida
22	0675877 S		Arresto guida
–	0676411 E	AP.	Telaio portapacchi
23	0675072 D		Telaio portapacchi
24	0676412 J		Supp. chiavistello
25	6311242 W		Vite TC 4 x 8
26	6332304 F		Rosetta dentellata Ø 4,3
27	0676205 E		Molla
28	0676414 B		Chiavistello
29	0676415 F		Maniglia
30	6321105 S		Dado M5
31	6332105 F		Rondella elastica Ø 5,3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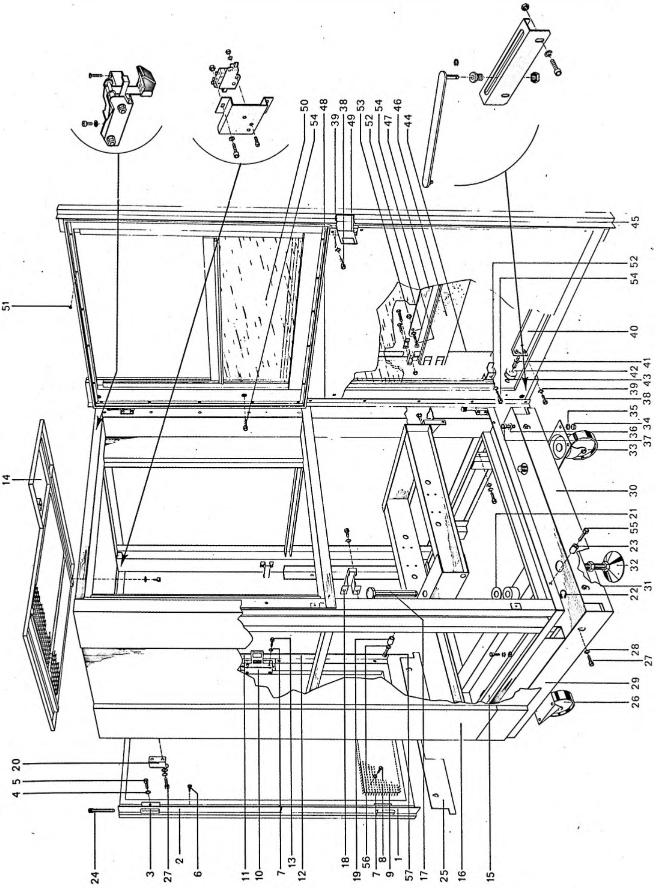
–	0817678	Z	AG. Porta posteriore
1	0675031	V	Fianchetto inferiore destro
2	0675032	H	Fianchetto superiore destro
3	0675538	U	Cerniera
4	6332104	B	Rondella elastica ø 4,3
5	6313114	S	Vite TC MAx8
6	6942210	X	Vite autofilettante 2,9x10
7	6311103	A	Rondella piana ø 3,2
8	6311231	R	Vite TC M3x8
9	0675454	T	Lamiera forata
10	0675699	G	Serratura
11	0675030	U	Fianchetto superiore sinistro
12	0675029	W	Fianchetto inferiore sinistro
13	6313101	G	Vite TCE M3x8
14	0817679	S	Copertura superiore
15	0675441	V	Telaio
16	0674369	K	Pannello laterale
17	0675551	Y	Perno
18	0678479	X	Gancio serratura
19	3525150	Z	Gommino
20	0675539	Y	Cerniera
21	0675550	X	Rosetta
22	6337129	T	Anello elastico
23	3525160	S	Gommino
24	0675537	F	Perno cerniera
–	0675414	X	AG. Base
25	0675987	D	Copertura posteriore
26	6476420	Q	Ruota fissa
27	6313114	S	Vite TCE M4x8
28	6331104	X	Rondella piana ø 4,3
29	0675988	S	Copertura laterale
30	0675987	D	Copertura anteriore
31	6321120	N	Dado M20
32	0675411	S	Piede
33	6476410	P	Ruota girevole
34	6321108	X	Dado 8MA
35	6332308	G	Rondella dentellata ø 8,4
36	6331108	Y	Rondella piana ø 8,4
37	6313165	T	Vite TCE M8x15
–	0817685	D	AG. Porta anteriore
38	6313101	G	Vite TCE M3x8
39	6331103	A	Rondella piana ø 3,2
40	0675489	B	Supporto pulegge
41	0675491	A	Studs per puleggia
42	0675515	V	Puleggia
43	6337107	L	Anello elastico
44	3593470	X	Cinghia Hevaflex
45	0675035	W	Fianchetto inferiore sinistro
46	0676651	S	Contrappeso
47	0675656	F	Profilo inferiore perspex
48	0675038	T	Fianchetto inferiore destro
49	0675699	G	Serratura
50	0675058	V	Portello scorrevole
51	6348290	X	Vite autofilettante
52	6331104	X	Rondella piana ø 4,3
53	6321104	W	Dado M4
54	6313115	W	Vite TC M4x10
55	6313101	G	Vite TCE M3x8
56	6331105	T	Rondella piana ø 5,3
57	6313135	Y	Vite TCE M5x25



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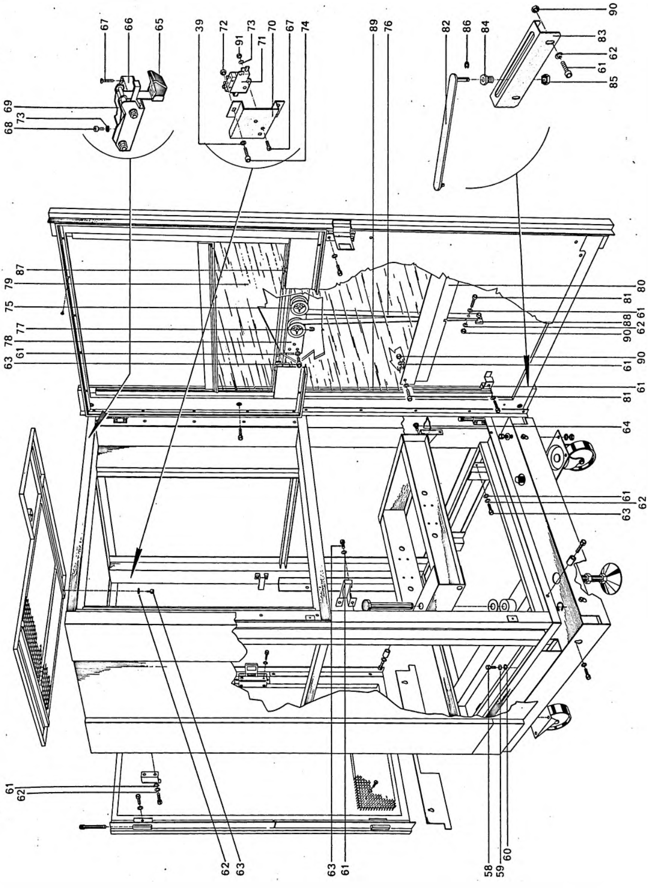
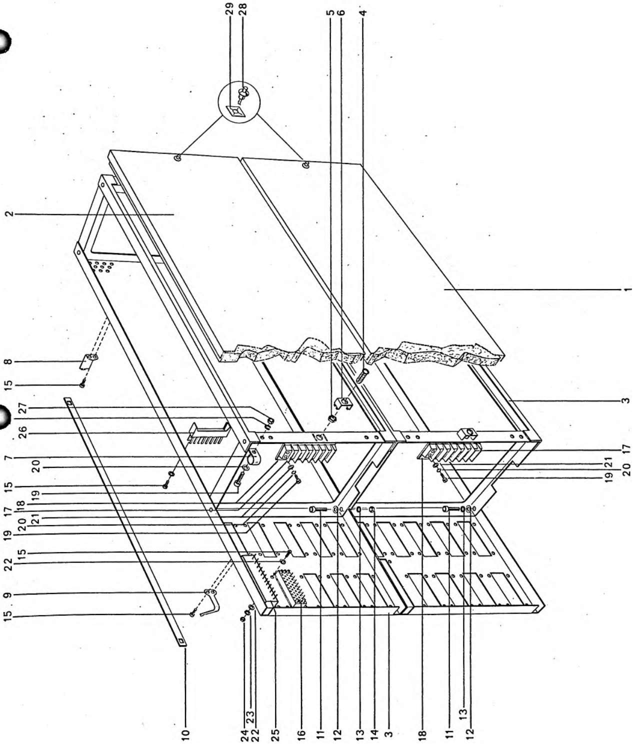
58	6313146	D	Vite TCE M6x10
59	6331106	F	Rondella piana ∅ 6,4
60	6332306	D	Rondella dentellata ∅ 6,4
61	6331104	X	Rondella piana ∅ 4,3
62	6332304	F	Rondella dentellata ∅ 4,3
63	6313114	S	Vite TCE M4x8
64	0678470	U	Studs
–	0676157	Z	AG. Microswitch "S0"
65	0875053	F	Riscontro
66	0001746	R	Microswitch
67	0680125	V	Vite 2,6x12
68	0680193	K	Vite 3x5
69	0675048	U	Battuta microswitch
–	0842840	J	AG. Microswitch "S1"
70	0837126	T	Omega porta switch
71	0665596	Q	Assieme microswitch
72	6321103	H	Dado M3
73	6332103	N	Rondella elastica ∅ 3,2
74	6313101	G	Vite TCCE 3x8
–	0676391	C	AG. Porta anteriore (con pulegge)
0679573 B –	(0676401	R)	AP. Puleggia
75	0676402	V	Puleggia
76	0676403	Z	Molla
77	6337109	D	Anello Benzing
78	0676398	A	Supporto pulegge
79	(0675657	B) →	Pannello scorrevole 0675053 X
80	0676394	H	Profilo inferiore pannello scorrevole
81	6311244	P	Vite TC 4x12
82	0675850	N	Braccio ferma porta
83	0675855	Q	Guida braccio
84	0675854	L	Boccola per guida
85	6321208	Z	Dado basso M8
86	6337106	Q	Anello Benzing ∅ 2,3
87	0675976	Y	Battuta per porta scorrevole
88	0676392	Q	Supporto pannello scorrevole
89	0676552	Q	Canalina guida vetro
90	6321104	W	Dado M4
91	9938211	H	Dado 2,6M4



1	0674250 M	Gruppo coperchio inferiore
2	0674251 N	Gruppo coperchio superiore
3	0674200 U	Telaio
4	0834663 Y	Ricettacolo Fastener
5	0834662 U	Dado Fastener
6	0835132 C	Supporto
7	5618054 V	Serracavo Looping tipo 2
8	0839473 S	Supporto a balestra destro
9	0839474 P	Supporto a balestra sinistro
10	0837894 Z	Riga numerata
11	6313132 B	Vite TCE 5MAx15
12	6331105 T	Rondella piana ∅ 5,3
13	6332105 F	Rondella elastica ∅ 5,3
14	6321105 S	Dado 5MA
15	6311230 Q	Vite TC 3MAx6
16	0842491 F	Connettore 34 contatti maschio
17	5612447 M	Morsettiera Rhodex K 606/A
18	0001147 H	Piastrina numerata 0-606
19	6311245 K	Vite TC M4x15
20	6331104 X	Rondella piana ∅ 4,3
21	0683081 S	Rondella elastica ∅ 4,3
22	0682454 P	Rondella piana ∅ 3,2
23	6332103 N	Rondella elastica ∅ 3,2
24	0682160 C	Dado M3
25	0842490 E	Connettore 50 contatti maschio
26	0834000 S	Connettore maschio Socapex
27	6321104 W	Dado M4
28	0834661 Q	Pulsante Fastener
29	0834665 R	Staffa elastica



GUN 150

1	0613236	E	AMFO
2	0614226	S	AMRU
3	0614224	J	CADIE
4	0615213	Y	CAL 4
5	0615210	P	CAP 1
6	0615217	Z	CAP 4
7	0618016	H	CILD
8	0616033	K	FICOA
9	0616043	L	FICON
10	0616034	G	FILUA
11	0612027	J	FLIPA
12	0612021	H	FLIPB
13	0616018	E	ICRE
14	0611420	T	INPO
15	0611521	W	INPS0A
16	0611520	V	INZE0A
17	0617318	Y	LURE
18	0611522	A	MATA0A
19	0611500	F	NOR A
20	0611501	G	NOR E
21	0611502	L	NOR I
22	0611503	L	NORSA
23	0613237	A	SELA
24	0612157	E	TARA
25	0617240	S	ULUN
26	0612130	S	Univ.

GUN 151

27	0614221	M	CADI C
28	0613033	N	INTO A0
29	0611500	F	NOR A
30	0613027	N	PARF A1
31	0613165	T	PARS A0
32	0614319	Q	POCA B0
33	0614312	S	SEBO A1
34	0612327	F	UNAP A0
35	0612158	T	URES B0
36	0618012	E	PONT A

GUN 152

37	0614226	S	AMRU
38	0614224	J	CADI E
39	0614225	N	CADI F
40	0613033	N	INTO A0
41	0611500	F	NOR A
42	0611501	G	NOR E
43	0613165	T	PARS A0
44	0614314	K	POCA
45	0614312	S	SEBO A1
46	0612327	F	UNAP A0
47	0612150	U	URES A0

GUN 153

1	0614221	M	CADI C
2	0613034	B	INTO A1
3	0611500	F	NOR A
4	0613027	N	PARF A1
5	0613165	T	PARS A0
6	0614320	N	POCA B1
7	0614312	S	SEBO A1
8	0612328	U	UNAP A1
9	0612159	X	URES B1
10	0618012	E	PONT A

GUN 154

11	0614226	S	AMRU
12	0614224	J	CADI E
13	0614225	N	CADI F
14	0613034	B	INTO A1
15	0611500	F	NOR A
16	0611501	G	NOR E
17	0613165	T	PARS A0
18	0614320	N	POCA B1
19	0614312	S	SEBO A1
20	0612328	U	UNAP A1
21	0612159	X	URES B1
22	0618012	E	PONT A

GUN 161

23	0614221	M	CADI C
24	0613033	N	INTO A0
25	0611500	F	NOR A
26	0615338	J	PAMI
27	0615317	T	PARI A0
28	0614319	Q	POCA B0
29	0614312	S	SEBO A1
30	0615319	L	TRAL
31	0612327	F	UNAP A0
32	0612158	T	URES B0
33	0618012	E	PONT A

GUN 162

34	0614226	S	AMRU
35	0614225	N	CADI F
36	0615320	J	CADI H
37	0613033	N	INTO A0
38	0611500	F	NOR A
39	0611501	G	NOR E
40	0615338	J	PAMI
41	0614319	Q	POCA B0
42	0614312	S	SEBO A1
43	0615319	L	TRAL
44	0612327	F	UNAP A0
45	0612158	T	URES B0
46	0618012	E	PONT A

GUN 163

1	0614226	S	AMRU
2	0614225	N	CADI F
3	0615320	J	CADI H
4	0613033	N	INTO A0
5	0611500	F	NOR A
6	0611501	G	NOR E
7	0615338	J	PAMI
8	0614317	T	PARI A0
9	0614319	Q	POCA B0
10	0614312	S	SEBO A1
11	0612158	T	URES B0
12	0615319	L	TRAL
13	0612327	F	UNAP A0
14	0618012	E	PONT A

GUN 164

15	0614221	M	CADI C
16	0613034	B	INTO A1
17	0611500	F	NOR A
18	0615338	J	PAMI
19	0615318	Q	PARI A2
20	0614320	N	POCA B1
21	0614312	S	SEBO A1
22	0615319	L	TRAL
23	0612328	U	UNAP A1
24	0612159	X	URES B1
25	0618012	E	PONT A

GUN 165

26	0614226	S	AMRU
27	0614225	N	CADI F
28	0615320	J	CADI H
29	0613034	B	INTO A1
30	0611500	F	NOR A
31	0611501	G	NOR E
32	0615338	J	PAMI
33	0614320	N	POCA B1
34	0614312	S	SEBO A1
35	0615319	L	TRAL
36	0612328	U	UNAP A1
37	0612159	X	URES B1
38	0618012	E	PONT A

GUN 166

39	0614226	S	AMRU
40	0614225	N	CADI F
41	0615320	J	CADI H
42	0613034	B	INTO A1
43	0611500	F	NOR A
44	0611501	G	NOR E
45	0615338	J	PAMI
46	0615318	Q	PARI A2
47	0614320	O	POCA B1
48	0614312	S	SEBO A1
49	0615319	L	TRAL
50	0612328	U	UNAP A1
51	0612159	X	URES B1
52	0618012	E	PONT A

GUN 167

1	0614221	M	CADI C
2	0613034	B	INTO A1
3	0611500	F	NOR A
4	0615338	I	PAMI
5	0615318	Q	PARI A2
6	0614318	L	POCA B2
7	0614317	X	SEBO A2
8	0615319	L	TRAL
9	0612329	Y	UNAP A2
10	0612160	V	URES B2
11	0618012	E	PONT A

GUN 168

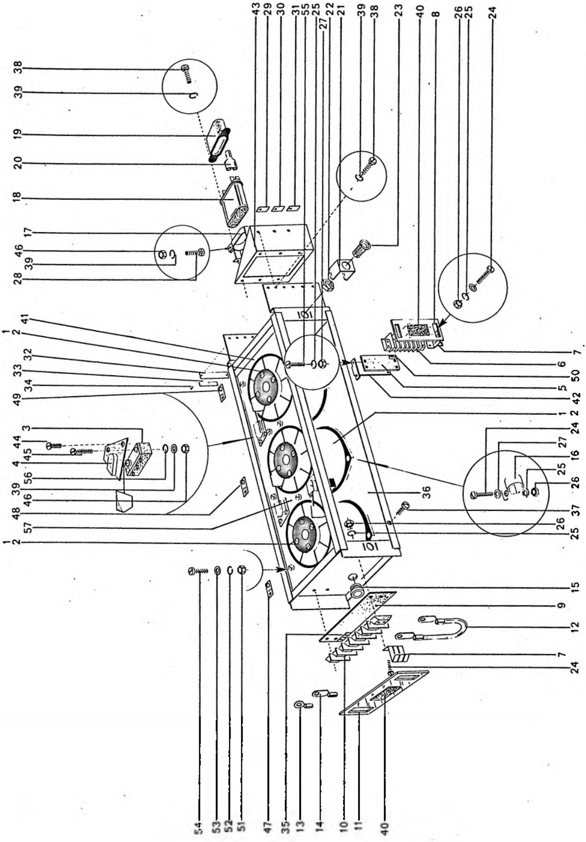
12	0614226	S	AMRU
13	0614225	N	CADI F
14	0615320	J	CADI H
15	0613034	B	INTO A1
16	0611500	F	NOR A
17	0611501	G	NOR E
18	0615338	J	PAMI
19	0614318	L	POCA B2
20	0614317	X	SEBO A2
21	0615319	L	TRAL
22	0612329	Y	UNAP A2
23	0612160	V	URES B2
24	0618012	E	PONT A

GUN 169

25	0614226	S	AMRU
26	0614225	N	CADI F
27	0615320	J	CADI H
28	0613034	B	INTO A1
29	0611500	F	NOR A
30	0611501	G	NOR E
31	0615338	J	PAMI
32	0615318	Q	PARI A2
33	0614318	L	POCA B2
34	0614317	X	SEBO A2
35	0615319	L	TRAL
36	0612329	Y	UNAP A2
37	0612160	V	URES B2
38	0618012	E	PONT A

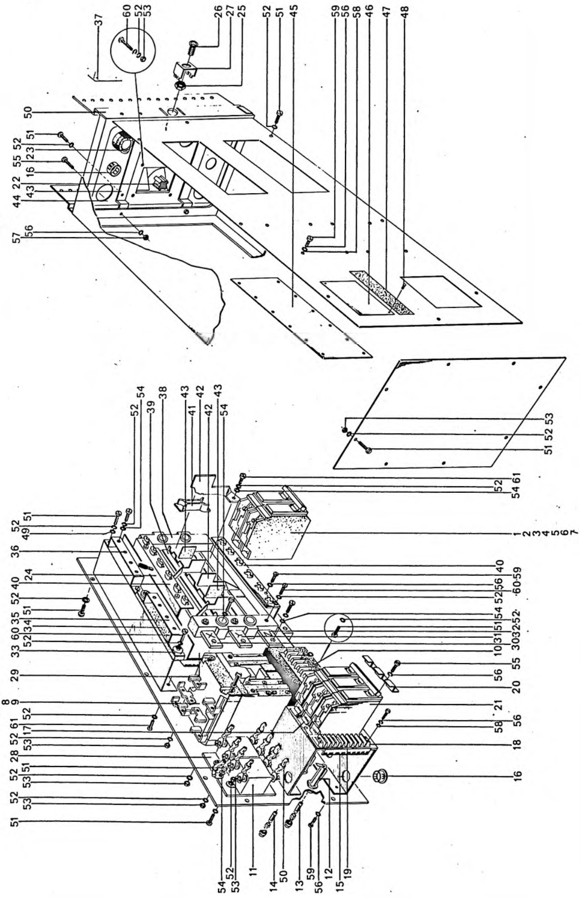
ventilatore (VAR 310-311)

1	6550200	G	Ventilatore AEREX trifase 220V - 50Hz
2	0001945	S	Ventilatore AEREX trifase 208V - 60Hz
3	0838983	S	Mikroshalter
4	0838981	J	Parapolvere per mikroshalter
5	0001147	H	Targhetta numerata Rhodex K 606
6	5612447	M	Morsettiera Rhodex K 606/A
7	0839653	U	Molletta
8	0839357	P	Piastrina isolante K 606
9	5612989	D	Targhetta numerata Rhodex K 609
10	5612544	B	Morsettiera Rhodex K 605/A
11	0839360	E	Piastrina isolante K 609
12	0641835	J	Cavallotto
13	5613350	W	Capocorda
14	5613328	S	Capocorda
15	0002111	N	Passacavo
16	0002112	M	Fascetta fissacavi
17	0001940	Y	Fascetta condensatori
18	0001514	A	Condensatore 2 /uF - 236V
19	0001941	Z	Terminale Boot protezione cond.
20	0000883	J	Capocorda AMP
-	0835484	X	AG. Supporto coperchi
21	0835132	C	Supporto
22	0834663	Y	Dado Fastener
23	0834662	U	Ricettacolo Fastener
24	6311245	K	Vite TC 4MAx15
25	6332104	B	Rondella elastica ø 4,3
26	6321104	W	Dado 4MA
27	6331104	X	Rondella ø 4,3
28	6311232	V	Vite TC 3MAx10
29	0831069	Y	Targhetta identif. C1
30	0831070	Q	Targhetta identif. C2
31	0831071	R	Targhetta identif. C3
32	0834397	W	Etichetta identif. U.E.
33	0834416	U	Etichetta identif. codice
34	0000647	G	Occhiello Ponti 2x4
35	0831062	U	Targhetta identif. P20
36	0839970	C	Coperchio inferiore
37	1925544	P	Vite autofilettante
38	6311230	Q	Vite TC 3MAx6
39	6332103	N	Rondella elastica ø 3,2
40	0831766	S	Targhetta autoadesiva
41	0838501	V	Supporto ventilatori
42	0838980	R	Supporto morsettiera
43	0838503	D	Supporto condensatori
44	0680050	D	Vite TC 2MAx6
45	6311236	M	Vite TS 3MAx20
46	6321103	H	Dado 3MA
47	0831073	Z	Targhetta ident. H1
48	0831074	N	Targhetta ident. H2
49	0831075	J	Targhetta ident. H3
50	0831063	Y	Targhetta ident. P20A
51	6321105	S	Dado 5MA
52	6332105	F	Rondella elastica ø 5,3
53	6331105	T	Rondella ø 5,3
54	6311258	R	Vite TC 5MAx15
55	6311243	S	Vite TC 4MAx10
56	6331103	A	Rondella ø 3,2
57	0838502	Y	Supporto ventilatori

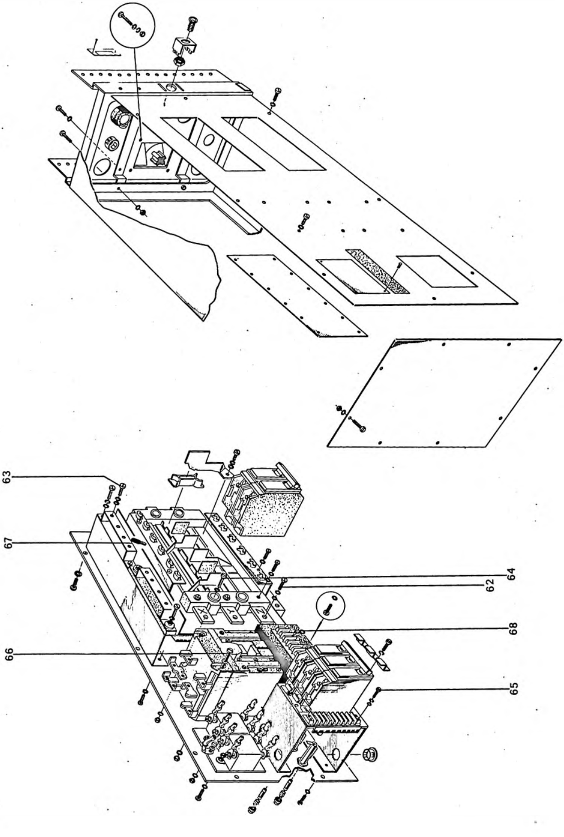


pannello di protezione e distribuzione alternate (ALI 260)

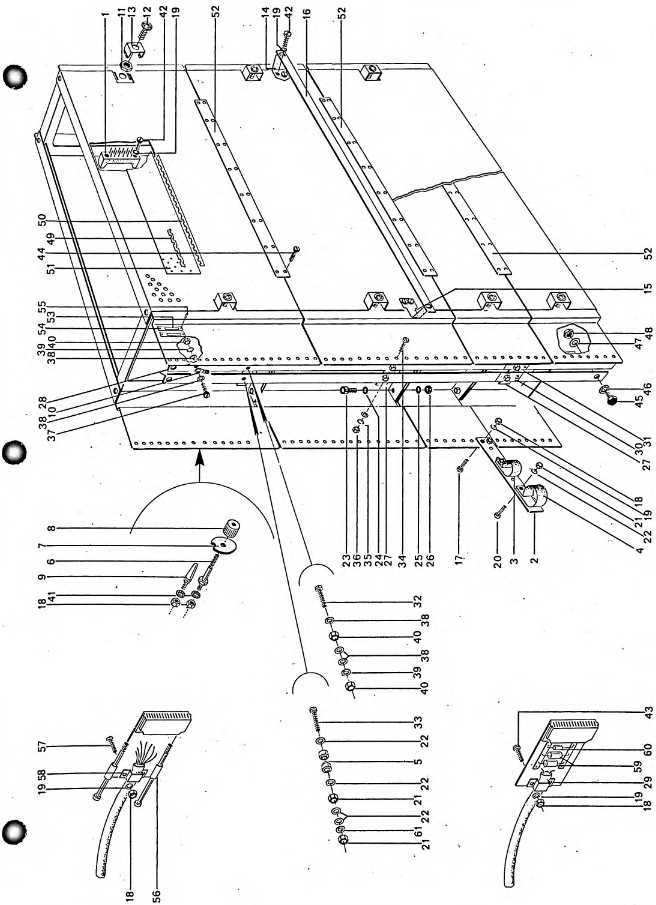
1	0001357 E	Breaker unipolare 10 A
2	0001474 E	Breaker bipolare 10 A
3	0001519 F	Breaker bipolare 15 A
4	0002114 E	Breaker tripolare 10 A
5	0001356 A	Breaker tripolare 15 A
6	0002115 A	Breaker tripolare 20 A
7	0001518 B	Breaker tripolare 30 A
8	0001885 C	Contattore 24 V - 50 Hz
9	0001884 G	Contattore 24 V - 60 Hz
10	0001315 S	Trasformatore AROS
11	0001449 G	Filtro ICAR
12	0001238 X	Portafusibile Littelfuse
13	0001244 X	Fusibile 3 A
14	0001218 V	Fusibile 0,5 A
15	0001858 W	Passacavo Wechesser
16	0001875 T	Passacavo Bushing
17	0838695 V	Aggancio Mobile
18	0838666 W	Piastrina numerata
19	5612455 E	Morsettiera Rhodex
20	0839622 V	Aggancio fisso
21	0001355 W	Breaker TQC 3430
22	0001354 S	Spina INLET
23	0001373 F	Passacavo Bushing
24	0839615 R	Supporto barre
-	0835484 X	AG. Supporto fissaggio coperchio
25	0834662 U	Dado Fastener
26	0834663 Y	Ricettacolo Fastener
27	0835132 C	Supporto
28	0839625 J	Piastra sotto filtro
29	0839621 R	Piastra isolante
30	0839616 Y	Barra di contatto tipo Z
31	0839620 Q	Barra di contatto tipo Y
32	0839618 N	Barra di contatto tipo X
33	0838987 T	Boccola isolante
34	0838988 Q	Piastrina isolante
35	0838986 X	Morsettiera neutro
36	0838985 K	Morsettiera terra
37	0834416 U	Etichetta identificazione codice
38	0001788 N	Supporto Block
39	0838669 K	Isolante centrale
40	0001883 K	Aggancio Breaker
41	0001791 R	Insulator
42	0001787 Z	Outer phase
43	0838670 R	Sostegno piastra connettori
44	0839634 P	Piastra connettori
45	0839627 S	Scorrevole
46	0831774 K	Targhetta tipo 3
47	0831773 W	Targhetta tipo 2
48	1925110 E	Chiodo autofilettante
49	6331104 X	Rondella ø 4,3
50	5613520 F	Capocorda
51	6311243 S	Vite TC 4MAx10
52	6332304 F	Rondella dentellata ø 4,3
53	6321104 W	Dado 4MA
54	0682456 Y	Rondella ott. nich. ø 4,3
55	6311232 V	Vite TC 3MAx10
56	6332303 J	Rondella dentellata ø 3,2
57	6321103 H	Dado 3MA
58	6331103 A	Rondella ø 3,2
59	6311231 R	Vite TC 3MAx8
60	6311245 K	Vite TC 4MAx15
61	6311242 W	Vite TC 4MAx8



62	0680506 T	Vite TC 4MAx8 ottone nich.
63	0680540 D	Vite TC 4MAx12 ottone nich.
64	6311247 T	Vite TC 4MAx20
65	6311234 N	Vite TC 3MAx15
66	0839626 W	Vite tenuta contattore
67	5613328 S	Capocorda
68	5613350 W	Capocorda


X
Y
Z

1	0834000	S	Connettore maschio Socapex
2	0834189	J	Bandella reggicavo
3	5618056	D	Serracavo Looping tipo 3
4	5618054	V	Serracavo Looping tipo 2
5	0834229	E	Rondella isolante
6	0839609	V	Tirante
7	0839612	U	Premicavo
8	0839610	P	Blocca cavo zigrinato
9	0839611	Q	Colonnina
10	5613333	D	Capocorda
–	0835384	X	AG. Supporto fissaggio coperchio
11	0834662	U	Dado Fastener
12	0834663	Y	Ricettacolo Fastener
13	0835132	C	Supporto
14	0839473	S	Supporto a balestra destro
15	0839474	P	Supporto a balestra sinistro
16	0839772	W	Riga numerata per pacchi
17	6311232	V	Vite TC 3MAx10
18	6321103	H	Dado 3MA
19	6332103	N	Rondella elastica ø 3,2
20	6311247	T	Vite TC 4MAx20
21	6321104	W	Dado 4MA
22	6331104	X	Rondella ø 4,3
23	6313132	B	Vite TCE 5MAx15
24	6331105	T	Rondella ø 5,3
25	6332105	F	Rondella elastica ø 5,3
26	6321105	S	Dado 5MA
27	0839939	B	Supporto barre alim.
28	0839714	P	Barra di alim.
29	0832549	Y	Fermacavo
30	0831095	U	Targhetta +20
31	0831096	G	Targhetta 0
32	0680551	F	Vite TC 4MAx18 ottone
33	6311248	Q	Vite TC 4MAx25
34	0680220	U	Vite TC 3MAx10 ottone
35	0683066	V	Rondella dent. ø 3,2
36	0682160	C	Dado 3MA ottone
37	0680550	E	Vite TC 4MAx15 ottone
38	0682456	X	Rondella ø 4,3 ottone
39	0683086	F	Rondella dent. ø 4,3
40	0682260	E	Dado 4MA ottone
41	6332303	J	Rondella dent. ø 3,2
42	6311230	Q	Vite TC 3MAx6
43	6311231	R	Vite TC 3MAx8
44	0681556	M	Vite autofilettante
45	0680310	W	Vite TE 8MAx15 ottone
46	0682560	L	Rondella ø 8,4
47	0683130	D	Rondella elastica ø 8,4
48	0682481	V	Dado 8MA ottone
49	0834007	C	Bandella di alimentazione
50	0834008	Z	Bandella di massa
51	0839009	V	Nastro isolante
52	0834424	M	Piastrina di collegamento massa
53	0834416	U	Etichetta identificaz. codice
54	0834396	S	Targhetta matricolazione U.E.
55	0000556	M	Occhiello 2x5
56	0839701	V	Dispositivo di bloccaggio
57	6312733	P	Vite TS 3MAx8
58	0834545	M	Fermacavo
59	5037781	S	Condensatore 50 µF – 25 V
60	5003635	L	Condensatore 0,47 µF – 63 V
61	6332104	B	Rondella elastica ø 4,3



GUN 500

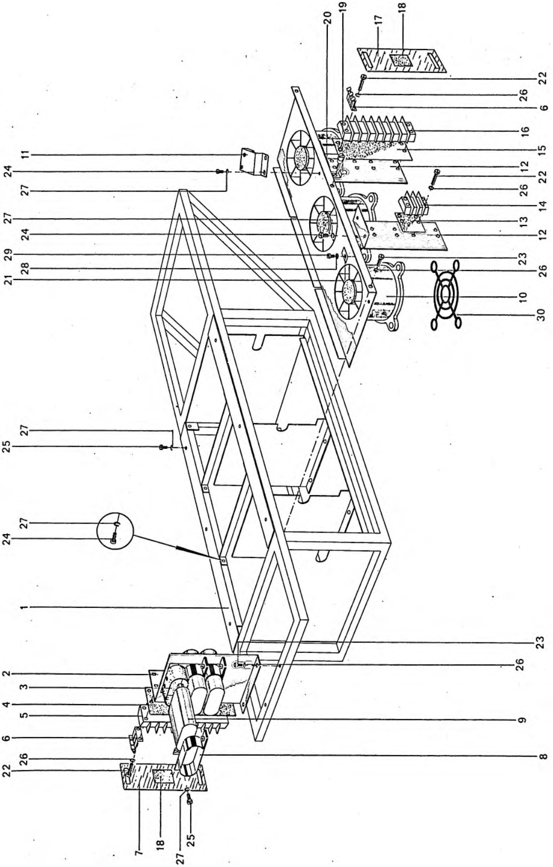
1	0617312 E	ALAM A
2	0615210 P	CAP 1
3	0615211 Q	CAP 2
4	0615212 U	CAP 3
5	0615217 Z	CAP 4
6	0615213 Y	CAL 4
7	0618016 H	CILD
8	0613150 Y	DOSO A1
9	0618011 S	FACI
10	0616033 K	FICO A
11	0612027 J	FLIP A
12	0612021 H	FLIP B
13	0612039 C	FLIP 0 D
14	0612322 A	GEMA C
15	0611421 U	INCA
16	0611420 T	INPO
17	0611520 V	INZE 0 A
18	0611525 X	MARI 0 1
19	0611041 X	MASE
20	0611500 F	NOR A
21	0611501 G	NOR E
22	0611502 L	NOR I
23	0611509 A	NORR BO
24	0611511 V	NORR CA
25	0611524 T	NORR CI
26	0611512 H	NORR DA
27	0611510 U	NORR DS
28	0611503 C	NORS
29	0612129 U	OSCI 0 A
30	0612128 Y	OSCI 0 B
31	0611519 X	REDI 0 1
32	0613152 D	SCAR A1
33	0615220 Q	SIMA A
34	0615238 Q	SIMA 0 C
35	0615236 X	TESO A1
36	0612130 S	UNIV
37	0612135 U	UNRA B

GUN 483

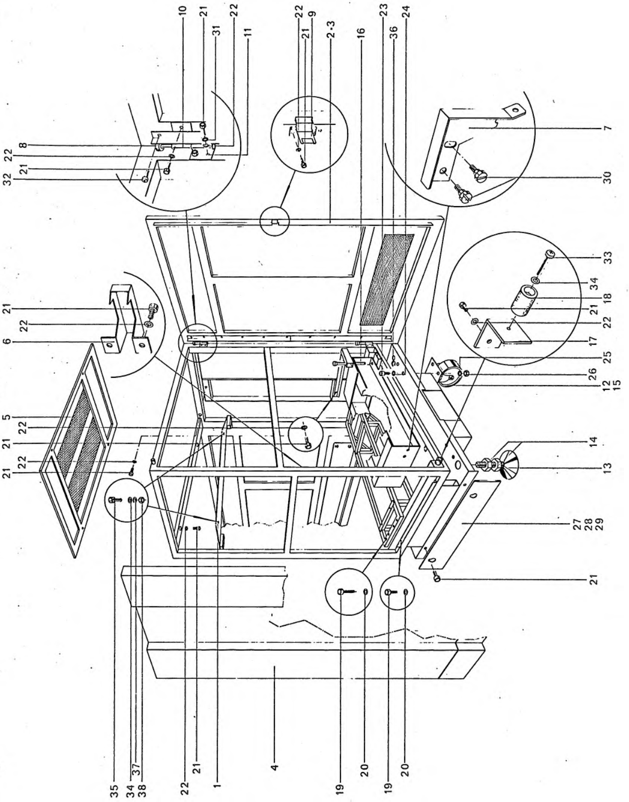
38	0613035 F	ALFI BO
39	0618011 S	FACI
40	0613168 Y	PIDE AO
41	0612145 V	UNAS 0 A
42	0612135 U	UNRA B
43	0612130 S	UNIV

ventilatore (VAR 332 AL) MTH 101÷172 MTC 101÷173 catalogo

1	0842723	E	Telaio ventilazione
2	0837518	T	Supporto morsettiera
3	0001941	Z	Terminal Boot
4	0001694	L	Piastrina numerata
5	0001693	X	Morsettiera Rhodex
6	0830653	U	Molletta
7	0830363	P	Piastrina isolante
8	0001940	Y	Fascetta condensatore
9	0001514	A	Condensatore 2 μF 236V.(Per 60 Hz)
10	0001945	S	Ventilatore AEREX 208V 60 Hz
	6550200	G	Ventilatore AEREX 220V 50 Hz
11	0842724	T	Protezione assieme
12	0837514	S	Supporto morsettiera
13	0001499	M	Piastrina numerata 0-502
14	0001497	U	Morsettiera K 502/A
15	5612999	E	Piastrina numerata 0-606
16	5612447	M	Morsettiera K 606/A
17	0830357	P	Piastrina isolante
18	3543104	P	Targhetta autoadesiva
19	0810151	G	Squadretta bloccaggio filtro
20	0810150	F	Vite bloccaggio filtro
21	0831073	Z	Targhetta ident. H1
	0831074	N	Targhetta ident. H2
	0831075	J	Targhetta ident. H3
22	6311245	K	Vite TC 4MAx15
23	6311242	W	Vite TC M4x8
24	6311231	R	Vite TC M3x8
25	6311230	Q	Vite TC M3x6
26	6332104	B	Rondella elastica ∅ 4,3
27	6332103	N	Rondella elastica ∅ 3,2
28	6331105	T	Rondella piana ∅ 5,3
29	6311258	R	Vite TC M5x15
30	0837161	J	Protezione vent.



1	0674375	K	Gruppo staffa ancoraggio pila
2	0675779	S	Porta anteriore assieme
3	0675825	L	Porta posteriore assieme
4	0674374	P	Pannello laterale
5	0675765	W	Copertura
6	0675730	Z	Gancio per serratura
7	0675700	A	Gancio d'arresto
8	0675537	F	Perno per cerniera
9	0675699	G	Gruppo serratura
10	0675538	U	Cerniera
11	0675539	Y	Cerniera
12	6476410	P	Ruota anteriore
13	0675411	S	Gruppo piede
14	6321120	N	Dado M20
15	6476420	Q	Ruota posteriore fissa
16	0675793	Q	Perno
17	0675729	T	Supporto gommino
18	3525150	Z	Gommino di battuta
19	6313154	W	Vite TCE M6x40
20	6331106	F	Rondella piana ø 6,3
21	6313114	S	Vite TCE M4x8
22	7465706	V	Rondella piana ø 4,3
23	6313165	T	Vite TCE M8x15
24	6331108	Y	Rondella piana ø 8,4
25	6332308	G	Rondella dentellata ø 8,4
26	6321108	X	Dado M8
27	0676499	Q	Copertura laterale
28	0676497	X	Copertura anteriore
29	0676498	L	Copertura posteriore
30	0677257	B	Stud
31	6332304	F	Rondella dentellata ø 4,3
32	6348290	X	Vite autofilettante
33	6348395	T	Vite autofilettante 3,9x25,4
34	6331105	T	Rondella piana ø 5,4
35	6313132	B	Vite TCE M5x15
36	6337114	V	Anello elastico
37	6332105	F	Rondella elastica ø 5,3
38	6321105	S	Dado esagonale M5


2-3

GUN 170

1	0617312 E	ALAM A
2	0615213 Y	CAL 4A
3	0615210 P	CAP 1A
4	0615211 Q	CAP 2A
5	0615212 U	CAP 3A
6	0615217 Z	CAP 4A
7	0618016 F	CILD A
8	0616033 K	FICO A
9	0612027 J	FLIP A
10	0612021 H	FLIP B
11	0612039 C	FLIP D
12	0612322 A	GEMA C
13	0611420 T	INPO A
14	.0611428 S	INPO E
15	0611521 W	INPS A
16	0611520 V	INZE A
17	0611525 X	MARI 1
18	0611502 L	NOR 1
19	0611500 F	NOR A
20	0611501 G	NOR E
21	0611509 A	NORR BO
22	0611511 V	NORR CA
23	0611512 H	NORR DA
24	0611510 U	NORR DS
25	0611503 Q	NORS A
26	0612129 U	OSCI A
27	0612128 Y	OSCI B
28	0611519 X	REDI 1
29	0615238 Q	SIMA C
30	0615335 M	TORE G
31	0612130 S	UNIV A
32	[illegible]2135 U	UNRA B
33	0615336 Z	UNRA M
34	0615330 K	VUSO A
35	0615326 Y	ZEDE A

GUN 171

36	0617312 E	ALAM A
37	0615210 P	CAP 1A
38	0615211 Q	CAP 2A
39	0615212 U	CAP 3A
40	0615217 Z	CAP 4A
41	0618016 F	CILD A
42	0613150 Y	DOSO A
43	0616033 K	FICO A
44	0612027 J	FLIP A
45	0612021 H	FLIP B
46	0612039 C	FLIP D
47	0612322 A	GEMA C
48	0611420 T	INPO A
49	0611428 S	INPO E
50	0611521 W	INPS A
51	0611520 V	INZE A
52	0616111 S	LIRI A
53	0611500 F	NOR A
54	0611501 G	NOR E
55	0611509 A	NORR BO
56	0611511 V	NORR CA
57	0611524 T	NORR CI
58	0611512 H	NORR DA
59	0611510 U	NORR DS
60	0611503 Q	NORS
61	0611519 X	REDI 1
62	0613152 D	SCAR A
63	0615335 M	TORE G
64	0615236 X	TESO A

GUN 172

1	0618011	S	FACI A
2	0615331	L	PHOS A0
3	0615315	K	RIFI A0
4	0615323	T	RARI A0
5	0615327	U	SOGU A0
6	0612130	S	UNIV A
7	0612135	U	UNRA B
8	0615336	Z	UNRA M

GUN 173

9	0613035	F	ALFI B0
10	0613168	Y	PIDE A0
11	0612145	V	UNAS A

GUN 174

12	0618011	S	FACI A
13	0615332	Y	PHOS A1
14	0615321	K	RIFI A1
15	0615324	Q	RARI A1
16	0615328	R	SOGU A1
17	0612135	U	UNRA B
18	0615336	Z	UNRA M
19	0612130	S	UNIV A

GUN 175

20	0613147	H	PIDE A1
21	0612145	V	UNAS A
22	0613036	K	ALFI B1

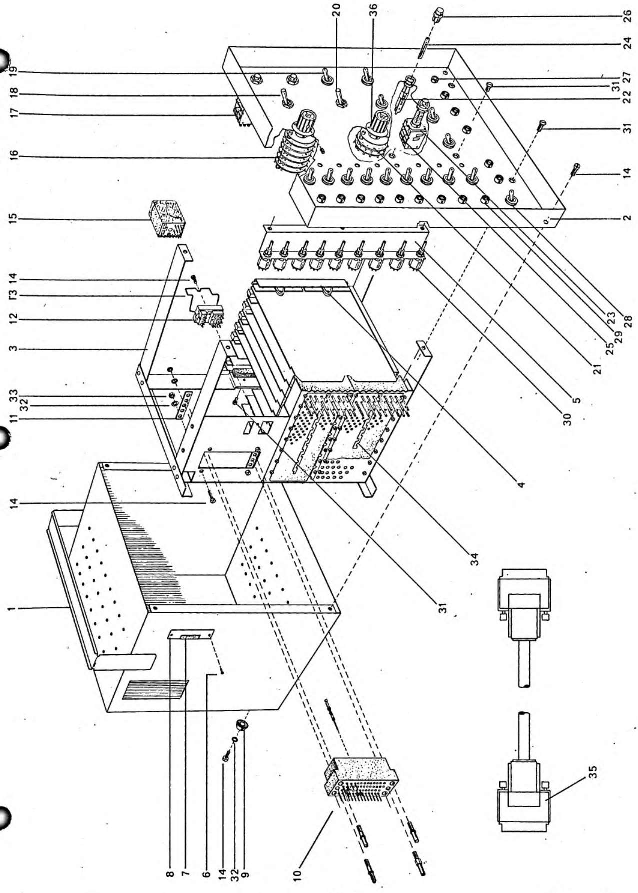
GUN 178

23	0618011	S	FACI A
24	0615333	U	PHOS A2
25	0615322	X	RIFI A2
26	0615325	L	RARI A2
27	0615329	M	SOGU A2
28	0612130	S	UNIV A
29	0612135	U	UNRA B
30	0615336	Z	UNRA M

GUN 179

31	0613037	P	ALFI B2
32	0613148	W	PIDE A2
33	0612145	V	UNAS A

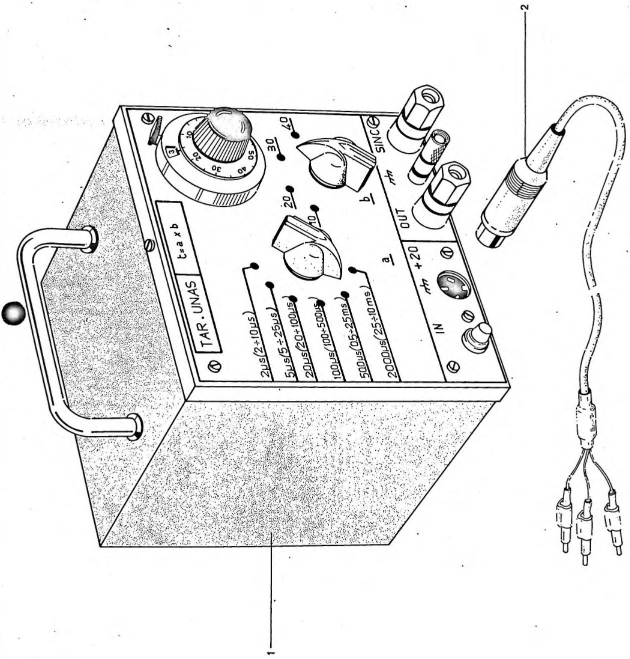
–	0646704	R	AG. VAR 600 complessivo
1	0837770	W	Contenitore
2	0837769	Y	Console
3	0837760	V	Supporto connettori.
4	0837767	F	Angolare tenuta piastrina
5	0837771	X	Supporto potenziometri
6	0000647	G	Occhiello ponti
7	0834416	U	Targhetta codice
8	0834397	W	Targhetta unità elementare
9	0005225	S	Piedini in gomma
10	0842490	E	Connettore AMP 50 cont. maschio
11	0838039	M	Barretta fissaggio connettore
12	5678634	U	Zoccolo relé
13	5302647	N	Molletta fissaggio relé
14	6311231	R	Vite TC M3x8
15	5302642	A	Relé Siemens
16	5114065	P	Commutatore 6 vie 9 pos.
17	5141508	Z	Microswitch 2D100
18	5111222	L	Deviatore
19	5102100	E	Interruttore unipolare
20	5104030	V	Deviatore tripolare
21	5114062	S	Commutatore 2 vie 9 pos.
22	5363150	R	Portalampada
23	0001993	N	Pulsante attuatore nero
24	5361011	M	Lampadino 12V
25	0001151	Z	Microswitch tipo 2D
26	5363152	W	Gemma rossa
27	5617145	U	Boccola non isolata
28	0001942	D	Deviatore
29	5610220	Q	Boccola isolata nera
30	4991570	X	Potenziometro 50 KOhm
31	6312732	K	Viti TS M3x6
32	6331103	A	Rondella piana ø 3,2
33	6321103	H	Dado 3MA
34	0834008	Z	Bandella di massa
35	0640101	S	Cavo
36	5625331	P	Manopola Gregorini



VAR 600

1	0613035	F	ALFI BO
2	0613037	P	ALFI B2
3	0613239	T	AMVA
4	0613150	Y	DOSO
5	0612320	V	GEMA-A
6	0612122	E	MURA
7	0611500	F	NOR A
8	0611501	G	NOR E
9	0612127	B	OQUA
10	0613168	Y	PIDE AO
11	0613148	W	PIDE A2
12	0615239	L	RECA
13	0618021	T	SUSI A
14	0612130	S	UNIV
15	0612150	U	URES AO

1	0646464 D	VAR 290
2	0800790 F	Cavo


1
2
TAR. UNAS
t=a x b
2µs (2÷10µs)
5µs (5÷25µs)
20µs (20÷100µs)
100µs (100÷500µs)
500µs (0,5÷2,5ms)
2000µs (2,5÷10ms)
a
b
10
20
30
40
SINC
OUT
IN
+20

REPERTORIO NUMERICO

Codice	Pag.	Rif.
0000556M	68	55
0000647G	62	34
0000647G	78	6
0000665C	32	9
0000665C	36	6
0000711G	38	12
0000726N	42	7
0000726N	46	4
0000797Z	16	72
0000813B	40	35
0000813B	42	9
0000843E	38	17
0000843E	46	3
0000844T	38	25
0000844T	46	9
0000867H	32	8
0000882N	16	54
0000882N	22	48
0000883J	62	20
0000898H	28	6
0000898H	34	6
0000965T	14	19
0000988A	16	55
0001108E	48	4
0001117E	14	20
0001133F	6	22
0001147H	56	18
0001147H	62	5
0001148W	26	23
0001149S	26	21
0001151Z	26	24
0001151Z	78	25
0001153H	26	22
0001155S	24	70
0001155S	26	13
0001156E	26	14
0001160Z	26	18
0001161S	26	19
0001162E	26	16
0001163A	26	15
0001216C	34	42
0001218V	46	1
0001218V	64	14
0001220X	38	11
0001220X	40	40
0001238X	28	30
0001238X	34	30
0001238X	64	12

Codice	Pag.	Rif.
0001244X	64	13
0001249U	28	33
0001249U	34	33
0001253B	28	29
0001253B	34	29
0001259V	34	32
0001262B	28	32
0001264Z	28	28
0001264Z	34	28
0001301C	28	11
0001307L	32	37
0001307L	36	22
0001308A	38	5
0001308A	44	5
0001315S	64	10
0001317A	34	6
0001319T	32	25
0001319T	36	21
0001324X	32	26
0001354S	64	22
0001355W	64	21
0001356A	64	5
0001357E	64	1
0001370W	28	14
0001370W	34	14
0001373F	64	23
0001385H	28	13
0001385H	34	13
0001402Q	32	40
0001402Q	36	36
0001414G	14	5
0001434A	38	23
0001434A	40	34
0001434A	42	2
0001434A	46	2
0001436J	40	27
0001449G	64	11
0001467R	22	46
0001469A	8	5
0001474E	64	2
0001497U	72	14
0001499M	72	13
0001501Q	42	10
0001506V	28	26
0001506V	34	26
0001511D	24	72
0001511D	26	17
0001514A	62	18

Mod. 0953

Codice	Pag.	Rif.
0001514A	72	9
0001518B	64	7
0001519F	64	3
0001554W	24	73
0001574G	32	5
0001574G	36	2
0001614C	30	45
0001614C	34	47
0001614C	48	3
0001614C	50	19
0001654G	10	23
0001669E	24	81
0001692T	32	38
0001692T	36	34
0001693X	72	5
0001694L	72	4
0001725B	28	4
0001725B	34	4
0001746R	54	66
0001787Z	64	42
0001788N	64	38
0001791R	64	41
0001793Z	32	46
0001793Z	36	42
0001796W	40	17
0001796W	42	26
0001798P	32	43
0001798P	36	39
0001798P	48	9
0001799K	48	8
0001823D	24	71
0001823D	26	20
0001852C	10	24
0001853G	48	5
0001858W	50	2
0001858W	64	15
0001875T	64	16
0001883K	64	40
0001884G	64	9
0001885C	64	8
0001932C	32	20
0001940Y	62	17
0001940Y	72	8
0001941Z	62	19
0001941Z	72	3
0001942D	78	28
0001945S	62	2
0001945S	72	10

Codice	Pag.	Rif.
0001948X	6	19
0001948X	8	11
0001950W	6	23
0001957B	10	20
0001970T	24	63
0001973C	22	10
0001993N	78	23
0001996R	40	30
0001996R	42	5
0002104R	18	26
0002105M	18	24
0002111N	62	15
0002112M	62	16
0002114E	64	4
0002115A	64	6
0002125B	32	27
0002125B	36	23
0002138H	32	41
0002138H	36	51
0002139D	28	12
0002139D	34	12
0002143L	28	24
0002143L	34	24
0005044D	20	62
0005133G	36	37
0005225S	78	9
0611041X	71	19
0611420T	58	14
0611420T	71	16
0611420T	76	13
0611420T	76	48
0611421U	71	15
0611428S	76	14
0611428S	76	49
0611500F	58	19
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0611500F	59	38
0611500F	60	5
0611500F	60	17
0611500F	60	30
0611500F	60	43
0611500F	61	3
0611500F	61	16
0611500F	61	29

Codice	Pag.	Rif.
0611500F	71	20
0611500F	76	19
0611500F	76	53
0611500F	81	7
0611501G	58	20
0611501G	58	42
0611501G	59	16
0611501G	59	39
0611501G	60	6
0611501G	60	31
0611501G	60	44
0611501G	61	17
0611501G	61	30
0611501G	71	21
0611501G	76	20
0611501G	76	54
0611501G	81	8
0611502L	58	21
0611502L	71	22
0611502L	76	18
0611503L	58	22
0611503C	71	28
0611503Q	76	25
0611503Q	76	60
0611509A	71	23
0611509A	76	21
0611509A	76	55
0611510U	71	27
0611510U	76	24
0611510U	76	59
0611511V	71	24
0611511V	76	22
0611511V	76	56
0611512H	71	26
0611512H	76	23
0611512H	76	58
0611519X	71	31
0611519X	76	28
0611519X	76	61
0611520V	58	16
0611520V	71	17
0611520V	76	16
0611520V	76	51
0611521W	58	15
0611521W	76	15
0611521W	76	50
0611522A	58	18
0611524T	71	25

Codice	Pag.	Rif.
0611524T	76	57
0611525X	71	18
0611525X	76	17
0612021H	58	12
0612021H	71	12
0612021H	76	10
0612021H	76	45
0612027J	58	11
0612027J	71	11
0612027J	76	9
0612027J	76	44
0612039C	71	13
0612039C	76	11
0612039C	76	46
0612122E	81	6
0612127B	81	9
0612128Y	71	30
0612128Y	76	27
0612129U	71	29
0612129U	76	26
0612130S	58	26
0612130S	71	36
0612130S	71	43
0612130S	76	31
0612130S	77	6
0612130S	77	19
0612130S	77	28
0612130S	81	14
0612135U	71	37
0612135U	71	42
0612135U	76	32
0612135U	77	7
0612135U	77	17
0612135U	77	29
0612145V	71	41
0612145V	77	11
0612145V	77	21
0612145V	77	33
0612150U	58	47
0612150U	81	15
0612157E	58	24
0612158T	58	35
0612158T	59	32
0612158T	59	45
0612158T	60	11
0612159X	59	9
0612159X	59	21
0612159X	60	24

Codice	Pag.	Rif.
0612159X	60	37
0612159X	60	51
0612160V	61	10
0612160V	61	23
0612160V	61	37
0612320V	81	5
0612322A	71	14
0612322A	76	12
0612322A	76	47
0612327F	58	34
0612327F	58	46
0612327F	59	31
0612327F	59	44
0612327F	60	13
0612328U	59	8
0612328U	59	20
0612328U	60	23
0612328U	60	36
0612328U	60	50
0612329Y	61	9
0612329Y	61	22
0612329Y	61	36
0613027N	58	30
0613027N	59	4
0613033N	58	28
0613033N	58	40
0613033N	59	24
0613033N	59	37
0613033N	60	4
0613034B	59	2
0613034B	59	14
0613034B	60	16
0613034B	60	29
0613034B	60	42
0613034B	61	2
0613034B	61	15
0613034B	61	28
0613035F	71	30
0613035F	77	9
0613035F	81	1
0613036K	77	22
0613037P	77	31
0613037P	81	2
0613147H	77	20
0613148W	77	32
0613148W	81	11
0613150Y	71	8
0613150Y	76	42

Codice	Pag.	Rif.
0613150Y	81	4
0613152D	71	32
0613152D	76	62
0613165T	58	31
0613165T	58	43
0613165T	59	5
0613165T	59	17
0613168Y	71	40
0613168Y	77	10
0613168Y	81	10
0613236E	58	1
0613237A	58	23
0613239T	81	3
0614221M	58	27
0614221M	59	1
0614221M	59	23
0614221M	60	15
0614221M	61	1
0614224J	58	3
0614224J	58	38
0614224J	59	12
0614225N	58	39
0614225N	59	13
0614225N	59	35
0614225N	60	2
0614225N	60	27
0614225N	60	40
0614225N	61	13
0614225N	61	26
0614226S	58	2
0614226S	58	37
0614226S	59	11
0614226S	59	34
0614226S	60	1
0614226S	60	26
0614226S	60	39
0614226S	61	12
0614226S	61	25
0614312S	58	33
0614312S	58	45
0614312S	59	7
0614312S	59	19
0614312S	59	29
0614312S	59	42
0614312S	60	10
0614312S	60	21
0614312S	60	34
0614312S	60	48

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Codice	Pag.	Rif.
0614314K	58	44
0614317T	60	8
0614317X	61	7
0614317X	61	20
0614317X	61	34
0614318L	61	6
0614318L	61	19
0614318L	61	33
0614319Q	58	32
0614319Q	59	28
0614319Q	59	41
0614319Q	60	9
0614320N	59	6
0614320N	59	18
0614320N	60	20
0614320N	60	33
0614320O	60	47
0615210P	58	5
0615210P	71	2
0615210P	76	3
0615210P	76	37
0615211Q	71	3
0615211Q	76	4
0615211Q	76	38
0615212U	71	4
0615212U	76	5
0615212U	76	39
0615213Y	58	4
0615213Y	71	6
0615213Y	76	2
0615217Z	58	6
0615217Z	71	5
0615217Z	76	6
0615217Z	76	40
0615220Q	71	33
0615236X	71	35
0615236X	76	64
0615238Q	71	34
0615238Q	76	29
0615239L	81	12
0615315K	77	3
0615317T	59	27
0615318Q	60	19
0615318Q	60	46
0615318Q	61	5
0615318Q	61	32
0615319L	59	30
0615319L	59	43

Codice	Pag.	Rif.
0615319L	60	12
0615319L	60	22
0615319L	60	35
0615319L	60	49
0615319L	61	8
0615319L	61	21
0615319L	61	35
0615320J	59	36
0615320J	60	3
0615320J	60	28
0615320J	60	41
0615320J	61	14
0615320J	61	27
0615321K	77	14
0615322X	77	25
0615323T	77	4
0615324Q	77	15
0615325L	77	26
0615326Y	76	35
0615327U	77	5
0615328R	77	16
0615329M	77	27
0615330K	76	34
0615331L	77	2
0615332Y	77	13
0615333U	77	24
0615335M	76	30
0615335M	76	63
0615336Z	76	33
0615336Z	77	8
0615336Z	77	18
0615336Z	77	30
0615338J	59	26
0615338J	59	40
0615338J	60	7
0615338J	60	18
0615338J	60	32
0615338J	60	45
0615338J	61	4
0615338J	61	18
0615338J	61	31
0616018E	58	13
0616033K	58	8
0616033K	71	10
0616033K	76	8
0616033K	76	43
0616034G	58	10
0616043L	58	9

Codice	Pag.	Rif.
0616111S	76	52
0617240S	58	25
0617312E	71	1
0617312E	76	1
0617312E	76	36
0617318Y	58	17
0618011S	71	9
0618011S	71	39
0618011S	77	1
0618011S	77	12
0618011S	77	23
0618012E	58	36
0618012E	59	10
0618012E	59	22
0618012E	59	33
0618012E	59	46
0618012E	60	14
0618012E	60	25
0618012E	60	38
0618012E	60	52
0618012E	61	11
0618012E	61	24
0618012E	61	38
0618016H	58	7
0618016H	71	7
0618016F	76	7
0618016F	76	41
0618021T	81	13
0620144M	8	AP
0620244P	42	AG
0620245K	44	AG
0620246X	46	AG
0620277W	40	AG
0620278K	38	AG
0620280V	38	AG
0640101S	78	35
0641835J	62	12
0643375T	20	AG
0643376A	20	AG
0645880W	20	AG
0646457Q	48	AG
0646464D	82	1
0646521E	20	AG
0646522J	20	AG
0646646P	20	AG
0646704R	78	AG
0646752R	20	AG
0646991E	50	AG

Codice	Pag.	Rif.
0665596Q	54	71
0672017P	14	10
0672018C	10	48
0672019G	10	49
0672023P	10	47
0672025G	10	AG
0672026L	10	AG
0672032L	16	66
0672043R	14	4
0672050H	16	75
0672163C	10	AP
0672164Z	10	46
0672165V	10	41
0672166H	10	43
0672167D	10	42
0672168S	10	44
0672347F	18	41
0672352B	18	39
0672354U	18	42
0672354U	20	60
0672387K	14	8
0672392P	10	33
0672396Q	10	36
0672397L	10	22
0672436L	10	AP
0672437Q	10	AP
0673152B	20	AG
0673153F	20	77
0673154U	20	76
0673156C	20	73
0673157G	20	69
0673158V	20	68
0673249S	18	48
0673259T	20	85
0673260Z	20	87
0673262E	20	78
0673263A	20	81
0673264X	20	79
0673265T	20	80
0673266F	20	AP
0673270S	20	95
0673271T	20	83
0673282Q	20	93
0673285D	18	31
0673287M	20	94
0673291D	20	92
0673375W	20	86
0674200U	56	3

Codice	Pag.	Rif.
0674250M	56	1
0674251N	56	2
0674369K	52	16
0674374P	74	4
0674375K	74	1
0674930J	12	5
0674934Q	12	6
0675029M	52	12
0675030U	52	11
0675031V	52	1
0675032H	52	2
0675035W	52	45
0675038T	52	48
0675048U	54	69
0675058V	52	50
0675072D	50	23
0675411S	52	32
0675411S	74	13
0675414X	52	AG
0675441V	52	15
0675443D	26	1
0675454T	52	9
0675489B	52	40
0675491A	52	41
0675515V	52	42
0675537F	52	24
0675537F	74	8
0675538U	52	3
0675538U	74	10
0675539Y	52	20
0675539Y	74	11
0675542B	48	1
0675550X	52	21
0675551Y	52	17
0675606N	26	12
0675656F	52	47
0675657B	54	79
0675699G	52	10
0675699G	52	49
0675699G	74	9
0675700A	74	7
0675729T	74	17
0675730Z	74	6
0675765W	74	5
0675779S	74	2
0675793Q	74	16
0675825L	74	3
0675850N	54	82

Codice	Pag.	Rif.
0675854L	54	84
0675855Q	54	83
0675866V	50	AP
0675867Z	50	20
0675876W	50	21
0675877S	50	22
0675976Y	54	87
0675987C	52	25
0675987E	52	30
0675988S	52	29
0676157Z	54	AG
0676205E	50	27
0676339Y	26	42
0676340W	26	41
0676391C	54	AG
0676392Q	54	88
0676394H	54	80
0676398A	54	78
0676401R	54	AP
0676402V	54	75
0676403Z	54	76
0676411E	50	AP
0676412J	50	24
0676414B	50	28
0676415F	50	29
0676497X	74	28
0676498L	74	29
0676499Q	74	27
0676552Q	54	89
0676651S	52	46
0677257B	74	30
0678470U	54	64
0678479X	52	18
0680050D	62	44
0680063P	18	25
0680112F	30	66
0680125V	54	67
0680193K	54	68
0680220U	68	34
0680221W	20	74
0680228U	30	64
0680310W	68	45
0680506T	66	62
0680540D	30	58
0680540D	66	63
0680550E	68	37
0680551F	68	32
0680705X	18	37

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Codice	Pag.	Rif.
0681556M	68	44
0682080V	32	57
0682160C	30	61
0682160C	56	24
0682160C	68	36
0682260E	30	59
0682260E	68	40
0682454P	30	63
0682454P	56	22
0682456X	30	57
0682456Y	64	54
0682456X	68	38
0682481V	68	48
0682560L	68	46
0682865D	22	42
0683039P	22	43
0683041N	30	65
0683041N	32	56
0683066V	30	62
0683066V	68	35
0683081S	56	21
0683086F	30	60
0683086F	68	39
0683130D	68	47
0687002B	24	84
0687005Y	10	12
0687006C	18	21
0687007G	20	58
0687010K	14	28
0687017V	14	48
0687020L	14	AG
0687021M	14	33
0687024J	16	74
0687027K	14	37
0687028K	14	38
0687029P	14	39
0687032S	14	42
0687033W	14	40
0687035P	14	AP
0687038L	14	43
0687039Q	14	46
0687040N	14	47
0687047Y	10	AG
0687048M	10	AP
0687049R	10	21
0687052U	10	4
0687054M	10	13
0687055R	10	11

Codice	Pag.	Rif.
0687056V	10	3
0687057Z	10	2
0687058N	10	1
0687060Q	10	5
0687063Z	6	1
0687070R	24	77
0687071J	24	79
0687072W	22	49
0687074P	18	AG
0687075K	18	30
0687076X	18	23
0687077T	18	29
0687078Q	18	27
0687081T	22	45
0687084Y	22	AG
0687085U	22	29
0687090T	22	30
0687091U	22	32
0687092G	22	33
0687093C	22	36
0687094Z	22	37
0687095V	22	39
0687096H	22	41
0687097D	22	44
0687100P	22	AG
0687102U	24	59
0687104M	24	60
0687110C	22	47
0687128C	22	AG
0687129G	22	6
0687132K	24	66
0687134C	22	5
0687142L	22	56
0687146M	22	57
0687150G	22	58
0687157J	18	7
0687162N	18	22
0687163J	18	4
0687170A	18	6
0687177L	18	16
0687178J	18	14
0687179D	18	15
0687180K	18	13
0687184R	24	68
0687187V	24	67
0687191M	14	2
0687193Y	14	3
0687196S	24	AG

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Codice	Pag.	Rif.
0687206X	18	36
0687209L	18	35
0687215G	18	2
0687215G	18	50
0687218D	18	9
0687221G	18	8
0687222L	18	10
0687222L	18	49
0687225H	18	5
0687226M	18	1
0687231H	18	AG
0687236N	18	47
0687237J	18	53
0687239M	18	54
0687241N	18	AG
0687243J	18	38
0687251B	18	33
0687255C	18	55
0687256Q	20	67
0687269D	14	17
0687270C	14	AG
0687271D	14	18
0687272R	14	26
0687273R	14	27
0687276J	14	15
0687280M	14	22
0687285P	18	34
0687294L	16	AG
0687295Q	16	68
0687296U	16	69
0687297Y	16	70
0687298M	16	58
0687299R	16	64
0687300K	14	AG
0687302Y	14	7
0687304R	14	6
0687306Z	16	AG
0687307V	16	59
0687308J	16	62
0687309N	16	57
0687310G	16	60
0687321A	14	30
0687322N	14	29
0687322N	14	49
0687325B	6	AG
0687332P	6	4
0687335C	6	9
0687336Q	6	3

Codice	Pag.	Rif.
0687337L	6	25
0687338H	6	39
0687339D	6	11
0687340B	6	37
0687341C	6	36
0687344E	6	AP
0687348A	6	38
0687390Q	6	AG
0687391R	6	7
0687393Z	6	8
0687394N	6	6
0687396W	6	28
0687396P	6	30
0687397S	6	29
0687400V	6	32
0687421L	12	7
0687423U	12	4
0687424R	12	3
0687426Z	12	2
0687450H	16	76
0687451P	8	2
0687453X	8	3
0687454L	8	4
0687455Q	8	AG
0708768S	10	15
0800790F	82	2
0800871R	12	12
0810507Z	38	8
0817678Z	52	AG
0817679S	52	14
0817685D	52	AG
0819134B	26	40
0819135F	26	39
0819138C	26	3
0819150F	72	20
0819151G	72	19
0830388L	28	3
0830388L	34	3
0831062U	62	35
0831063Y	62	50
0831069Y	62	29
0831070Q	62	30
0831071R	62	31
0831073Z	62	47
0831073Z	72	21
0831074N	62	48
0831074N	72	21
0831075J	62	49

Codice	Pag.	Rif.
0831075J	72	21
0831095U	68	30
0831096G	68	31
0831106U	26	32
0831108M	26	31
0831766S	22	15
0831766S	32	12
0831766S	48	6
0831766S	62	40
0831773W	64	47
0831774K	64	46
0831791Y	26	29
0831792C	26	28
0831797H	26	25
0831805P	26	26
0832547C	38	10
0832549Y	68	29
0834000S	56	26
0834000S	68	1
0834007C	68	49
0834008Z	68	50
0834008Z	78	34
0834189J	68	2
0834229E	68	5
0834396S	68	54
0834397W	62	32
0834397W	78	8
0834416U	62	33
0834416U	64	37
0834416U	68	53
0834416U	78	7
0834424M	68	52
0834545M	68	58
0834661Q	56	28
0834662U	56	5
0834662U	62	23
0834662U	64	25
0834662U	68	11
0834663Y	56	4
0834663Y	62	22
0834663Y	64	26
0834663Y	68	12
0834665R	56	29
0835132C	56	6
0835132C	62	21
0835132C	64	27
0835132C	68	13
0835384X	68	AG
0835484X	62	AG
0835484X	64	AG
0836830R	24	69
0837126T	54	70
0837161J	72	30
0837189W	36	57
0837215Q	50	14
0837286B	36	31
0837289Y	36	32
0837481A	34	2
0837489C	34	15
0837490A	34	1
0837491B	36	1
0837514S	72	12
0837518T	72	2
0837760V	78	3
0837767F	78	4
0837769Y	78	2
0837770W	78	1
0837771X	78	5
0837883B	32	35
0837885V	32	3
0837894Z	56	10
0837970K	32	1
0838027T	32	4
0838028Q	30	43
0838032X	28	23
0838032X	34	23
0838039M	78	11
0838077Y	30	52
0838078M	28	25
0838078M	34	25
0838081Y	32	36
0838116P	28	2
0838117K	28	40
0838117K	34	40
0838119C	32	2
0838123K	32	39
0838123K	36	35
0838124G	32	45
0838124G	36	41
0838125C	32	42
0838125C	36	38
0838126Q	32	31
0838127L	28	15
0838131C	28	1
0838133L	32	24
0838137M	28	9

Codice	Pag.	Rif.
0838137M	34	9
0838137M	34	21
0838140C	30	54
0838141D	28	34
0838141D	34	34
0838143M	28	10
0838143M	34	10
0838147N	26	27
0838201P	36	20
0838254D	26	9
0838255H	26	10
0838256M	26	4
0838257R	26	6
0838259A	26	5
0838266N	26	8
0838274F	30	70
0838415R	30	44
0838501V	62	41
0838502Y	62	57
0838503D	62	43
0838666W	64	18
0838669K	64	39
0838670R	64	43
0838695V	64	17
0838723X	50	12
0838980R	62	42
0838981J	62	4
0838983S	62	3
0838985K	64	36
0838986X	64	35
0838987T	64	33
0838988Q	64	34
0839009V	68	51
0839020M	10	14
0839257M	26	30
0839261R	28	21
0839271E	34	20
0839274B	28	20
0839355F	32	44
0839355F	36	40
0839355P	48	7
0839356K	32	11
0839356K	36	8
0839357P	22	14
0839357P	50	17
0839357P	62	8
0839357P	72	17
0839358C	36	10

Codice	Pag.	Rif.
0839359G	32	18
0839360E	32	19
0839360E	36	16
0839360E	62	11
0839361F	14	51
0839361F	32	13
0839361F	36	15
0839363P	72	7
0839368D	36	59
0839473S	56	8
0839473S	68	14
0839474P	56	9
0839474P	68	15
0839609V	68	6
0839610P	68	8
0839611Q	68	9
0839612U	68	7
0839615R	64	24
0839616Y	64	30
0839618N	64	32
0839620Q	64	31
0839621R	64	29
0839622V	64	20
0839625J	64	28
0839626W	66	66
0839627S	64	45
0839634P	64	44
0839653U	14	50
0839653U	22	12
0839653U	32	10
0839653U	36	7
0839653U	48	17
0839653U	50	9
0839653U	62	7
0839653U	72	6
0839701V	68	56
0839714P	68	28
0839772W	68	16
0839831F	38	27
0839831F	40	41
0839833P	40	42
0839939B	68	27
0839970C	62	36
0842346V	28	22
0842442E	28	31
0842443A	28	5
0842490E	56	25
0842490E	78	10

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0842491F	32	34
0842491F	36	30
0842491F	56	16
0842723E	72	1
0842724T	72	11
0842780D	34	5
0842781C	34	31
0842840J	54	AG
0842990Z	12	AG
0875053F	54	65
1925110E	64	48
1925544P	62	37
1952133X	30	67
1952184Z	30	42
3361209U	48	2
3361209U	50	1
3361210Z	28	41
3361210Z	34	41
3525150Z	52	19
3525150Z	74	18
3525160S	52	23
3543104P	36	9
3543104P	72	18
3593470X	52	44
3661045A	12	8
4369744M	8	20
4922770Y	46	15
4922850R	38	22
4923050W	40	22
4923050V	42	17
4923050V	46	18
4923530U	46	17
4923690C	40	13
4923690C	42	23
4924050J	40	23
4924050J	42	25
4924210H	40	3
4924370H	40	12
4924370H	42	16
4924523W	38	26
4924532W	40	2
4924532W	42	15
4924532W	46	14
4924690Z	40	4
4924770R	38	15
4924770R	46	13
4925050N	38	14
4925050N	46	8

Codice	Pag.	Rif.
4925530N	42	30
4925610M	40	16
4926450Z	40	11
4926450Z	42	34
4927050W	6	13
4927050W	8	16
4932047B	6	16
4932525S	38	2
4932525S	40	24
4932526E	42	24
4932526E	44	8
4932725W	24	75
4933046B	14	44
4933246T	8	17
4933531W	38	21
4933687N	38	4
4933687N	44	7
4933725S	38	28
4933725S	46	10
4933805K	38	3
4933805K	44	6
4933846T	6	12
4933887B	40	8
4933887B	42	29
4934047U	38	13
4934047U	40	9
4934047U	42	32
4934047U	46	11
4934086C	40	7
4934086C	42	33
4934207X	40	15
4934207X	42	31
4934278T	42	28
4934287T	6	15
4934287T	40	19
4934327P	38	24
4934327P	40	6
4934327P	42	21
4934327P	46	7
4934367K	40	5
4934367K	42	20
4934527Y	40	21
4934527Y	42	22
4934684X	6	14
4934684X	8	15
4934926Q	42	35
4934965G	42	36
4935047Y	40	10

Codice	Pag.	Rif.
4935687F	40	18
4935687F	42	27
4940437V	38	6
4940437V	44	1
4961050R	38	1
4961050R	44	9
4962072C	38	29
4962072Q	46	16
4962710W	40	20
4962710W	42	18
4963756C	38	16
4963756C	46	12
4963878J	40	14
4963878J	42	19
4970071L	38	9
4970071L	44	4
4970089X	36	24
4970110D	44	3
4970350E	32	22
4970351F	36	18
4971072C	38	7
4971082A	44	2
4972393G	32	21
4972393G	36	17
4972646D	36	60
4973230K	34	22
4973245N	34	45
4991300Y	40	1
4991300V	42	14
4991310M	28	17
4991310M	34	17
4991375W	28	16
4991375W	34	16
4991520S	8	19
4991570X	78	30
4999026H	34	44
4999026H	36	52
4999027E	34	43
4999027E	36	53
4999052B	32	23
4999052B	36	19
4999053F	36	58
4999530V	28	19
4999530V	34	19
4999550X	28	18
4999550X	34	18
5003395L	38	19
5003395L	40	25

Codice	Pag.	Rif.
5003395L	42	11
5003395L	46	5
5003635L	68	60
5003833Q	22	24
5006845F	6	18
5006845F	8	13
5006845F	46	6
5006850E	38	18
5017845Y	10	19
5017845Y	32	32
5031710Z	40	26
5031710Z	40	28
5031710Z	42	13
5037435G	40	29
5037435G	42	12
5037500R	6	17
5037500R	8	14
5037781S	68	59
5038900X	36	33
5041783J	22	27
5091060F	32	29
5091075A	36	37
5102100E	34	46
5102100E	78	19
5104030V	78	20
5111222L	78	18
5114062S	78	21
5114065P	78	16
5114310D	26	7
5114315F	26	2
5141504Y	24	74
5141504Y	26	33
5141508Z	78	17
5241302D	28	38
5241302Y	34	38
5300081H	22	38
5300087J	22	40
5302642A	78	15
5302647N	78	13
5303430B	16	61
5326245M	32	14
5326245M	36	11
5326624X	36	61
5361011M	78	24
5363150R	78	22
5363152W	78	26
5427060F	36	25
5427070H	36	28

Codice	Pag.	Rif.
5455212W	32	17
5455217T	32	16
5455218Q	32	15
5455252S	36	12
5455255P	36	14
5455260N	36	13
5523235T	6	2
5523237B	6	5
5523240S	8	1
5540440X	12	1
5541340N	50	16
5571690C	22	28
5572652F	22	1
5610021W	28	8
5610021W	34	8
5610024T	28	7
5610024T	34	7
5610220Q	78	29
5612405M	22	17
5612438H	24	76
5612447M	36	26
5612447N	50	18
5612447M	56	17
5612447M	62	6
5612447M	72	16
5612455E	64	19
5612540O	32	30
5612544B	62	10
5612550E	14	52
5612552K	6	31
5612594Z	24	78
5612960T	22	11
5612965S	36	5
5612989D	62	9
5612999E	36	27
5612999E	50	7
5612999E	72	15
5613328S	62	14
5613328S	66	67
5613333D	10	37
5613333D	68	10
5613350W	16	73
5613350W	22	26
5613350W	62	13
5613350W	66	68
5613520F	64	50
5613526M	10	28
5613553K	22	21

Codice	Pag.	Rif.
5613569E	28	37
5613569E	32	33
5613569E	34	37
5613569E	36	29
5615700E	32	6
5615700E	36	3
5617145U	78	27
5618013C	12	11
5618052C	10	30
5618052C	12	13
5618052C	22	4
5618052C	32	7
5618052C	36	4
5618052C	48	10
5618052C	50	3
5618054V	10	18
5618054V	24	83
5618054V	56	7
5618054V	68	4
5618056D	68	3
5618243S	50	8
5618247T	22	22
5618250J	10	10
5618250J	10	38
5618672E	12	10
5625331P	78	36
5676992P	14	1
5678634U	78	12
5822725X	40	32
5822725X	42	1
5822840J	14	45
5824762X	6	20
5824782H	40	33
5824782H	42	3
5826525U	34	11
5826832X	8	12
5826832X	40	31
5826832X	42	4
5831016S	28	36
5831016S	34	36
5831025P	22	19
5831025P	22	55
5831301M	40	39
5833402K	38	20
5835456W	28	35
5835456W	34	35
5835527Z	40	38
5835750N	40	36

Codice	Pag.	Rif.
5835750N	42	6
5835860A	40	37
5835860A	42	8
5836400B	22	20
5836400B	28	39
5836400B	34	39
5852120L	18	32
5882310S	6	21
5882310S	8	18
6171274L	24	62
6171282C	24	61
6171286D	20	90
6171350N	18	12
6171350N	24	82
6171380Z	20	91
6171380T	24	80
6311103A	52	7
6311230Q	6	35
6311230Q	22	3
6311230Q	24	65
6311230Q	30	53
6311230Q	32	50
6311230Q	36	46
6311230Q	56	15
6311230Q	62	38
6311230Q	68	42
6311230Q	72	25
6311231R	6	26
6311231R	12	15
6311231R	22	51
6311231R	26	36
6311231R	30	51
6311231R	32	60
6311231R	52	8
6311231R	64	59
6311231R	68	43
6311231R	72	24
6311231R	78	14
6311232V	12	16
6311232V	32	61
6311232V	62	28
6311232V	64	55
6311232V	68	17
6311233Z	22	18
6311233Z	22	53
6311234N	30	49
6311234N	48	15
6311234N	66	65

Codice	Pag.	Rif.
6311236M	62	45
6311242W	10	32
6311242W	12	17
6311242W	22	9
6311242W	30	48
6311242W	32	62
6311242W	36	56
6311242W	50	25
6311242W	64	61
6311242W	72	23
6311243S	62	55
6311243S	64	51
6311244P	22	13
6311244P	54	81
6311245K	18	43
6311245K	18	56
6311245K	20	89
6311245K	32	47
6311245K	36	43
6311245J	48	12
6311245K	56	19
6311245K	62	24
6311245K	64	60
6311245K	72	22
6311247T	22	16
6311247T	32	58
6311247T	36	54
6311247J	50	4
6311247T	66	64
6311247T	68	20
6311248Q	68	33
6311258C	32	55
6311258R	62	54
6311258R	72	29
6311268J	30	68
6312732K	78	31
6312733P	68	57
6312755A	12	18
6313050F	6	24
6313096W	18	17
6313101G	26	37
6313101G	52	13
6313101G	52	38
6313101G	52	55
6313102L	18	3
6313104D	20	61
6313107R	18	45
6313109A	20	84

Codice	Pag.	Rif.
6313113D	28	27
6313113D	34	27
6313114S	8	9
6313114S	10	8
6313114S	10	16
6313114S	20	88
6313114S	52	5
6313114S	52	27
6313114S	54	63
6313114S	74	21
6313115W	10	39
6313115W	14	24
6313115W	16	53
6313115W	20	59
6313115W	22	52
6313115W	26	38
6313115W	48	16
6313115W	52	54
6313116A	8	6
6313116F	14	14
6313116A	14	35
6313117W	16	65
6313117W	22	50
6313119X	6	10
6313119X	20	63
6313120V	6	34
6313120V	14	23
6313120V	18	44
6313121W	16	56
6313125X	10	50
6313132B	10	51
6313132B	56	11
6313132B	68	23
6313132B	74	35
6313135Y	52	57
6313146D	54	58
6313148W	10	7
6313154W	74	19
6313165T	12	19
6313165T	52	37
6313165T	74	23
6313167B	12	20
6313702Y	16	63
6313712N	26	34
6313738H	16	71
6316102R	14	25
6316102R	18	40
6316111S	14	41

Codice	Pag.	Rif.
6316113A	14	11
6316135V	14	12
6321103H	12	28
6321103H	14	36
6321103H	22	23
6321103H	22	35
6321103H	30	50
6321103H	30	55
6321103H	48	13
6321103H	50	10
6321103H	50	15
6321103H	54	72
6321103H	62	46
6321103H	64	57
6321103H	68	18
6321103H	78	33
6321104W	8	8
6321104W	10	29
6321104W	12	29
6321104W	22	25
6321104W	52	53
6321104W	56	27
6321104W	62	26
6321104W	64	53
6321104W	68	21
6321105S	12	14
6321105S	12	30
6321105S	20	65
6321105S	32	54
6321105S	36	50
6321105S	56	14
6321105S	62	51
6321105S	68	26
6321105S	74	38
6321108X	14	32
6321108X	52	34
6321108X	74	26
6321120N	52	31
6321120N	74	14
6321208Z	54	85
6331103A	12	21
6331103A	18	18
6331103A	22	2
6331103A	22	54
6331103A	26	35
6331103A	30	56
6331103A	32	59
6331103A	36	55

Codice	Pag.	Rif.
6331103A	48	18
6331103A	50	11
6331103A	52	39
6331103A	62	56
6331103A	64	58
6331103A	78	32
6331104X	8	10
6331104X	10	6
6331104X	10	17
6331104X	12	22
6331104X	20	64
6331104X	22	7
6331104X	30	46
6331104X	32	49
6331104X	36	45
6331104X	48	11
6331104X	50	6
6331104X	52	28
6331104X	52	52
6331104X	54	61
6331104X	56	20
6331104X	62	27
6331104X	64	49
6331104X	68	22
6331105T	12	23
6331105T	20	66
6331105T	32	52
6331105T	36	48
6331105T	52	56
6331105T	56	12
6331105T	62	53
6331105T	68	24
6331105T	72	28
6331105T	74	34
6331106F	10	9
6331106F	54	59
6331106F	74	20
6331108Y	12	24
6331108Y	14	31
6331108Y	52	36
6331108Y	74	24
6332103N	12	25
6332103N	18	19
6332103N	22	34
6332103N	32	51
6332103N	36	47
6332103N	48	14
6332103N	54	73

Codice	Pag.	Rif.
6332103N	56	23
6332103N	62	39
6332103N	68	19
6332103N	72	27
6332104B	8	7
6332104B	12	26
6332104B	14	21
6332104B	14	34
6332104B	20	57
6332104B	22	8
6332104B	30	47
6332104B	32	48
6332104B	36	44
6332104B	50	5
6332104B	52	4
6332104B	62	25
6332104B	68	61
6332104B	72	26
6332105F	18	46
6332105F	32	53
6332105F	36	49
6332105F	56	13
6332105F	62	52
6332105F	68	25
6332105F	74	37
6332108C	12	27
6332303J	20	75
6332303J	64	56
6332303J	68	41
6332304F	50	26
6332304F	54	62
6332304F	64	52
6332304F	74	31
6332306D	30	69
6332306D	54	60
6332308G	52	35
6332308G	74	25
6337106Q	54	86
6337107L	52	43
6337109D	10	45
6337109D	16	67
6337109D	18	11
6337109D	18	51
6337109D	22	31
6337109D	54	77
6337111Y	18	28
6337111Y	26	11
6337114V	74	36

Codice	Pag.	Rif.
6337129T	52	22
6337522M	14	13
6341113Y	14	16
6341134P	14	9
6341501B	20	82
6341707Q	18	52
6348290X	24	64
6348290X	52	51
6348290X	74	32
6348395T	74	33
6441207Y	10	26
6441219W	10	27
6469549B	18	20
6476410P	52	33
6476410P	74	12
6476420Q	52	26
6476420Q	74	15
6550200G	62	1
6550200G	72	10
6942210X	52	6
6949336S	12	9
7454736P	6	33
7454750B	50	13
7465706V	74	22
9920355G	10	34
9920358D	20	72
9940340K	6	27
9940357J	20	70
9940427Z	10	31
9940427Z	10	35
9940504Z	10	52
9944371H	20	71
9944421N	10	40
9993658T	10	25

Codice	Pag.	Rif.